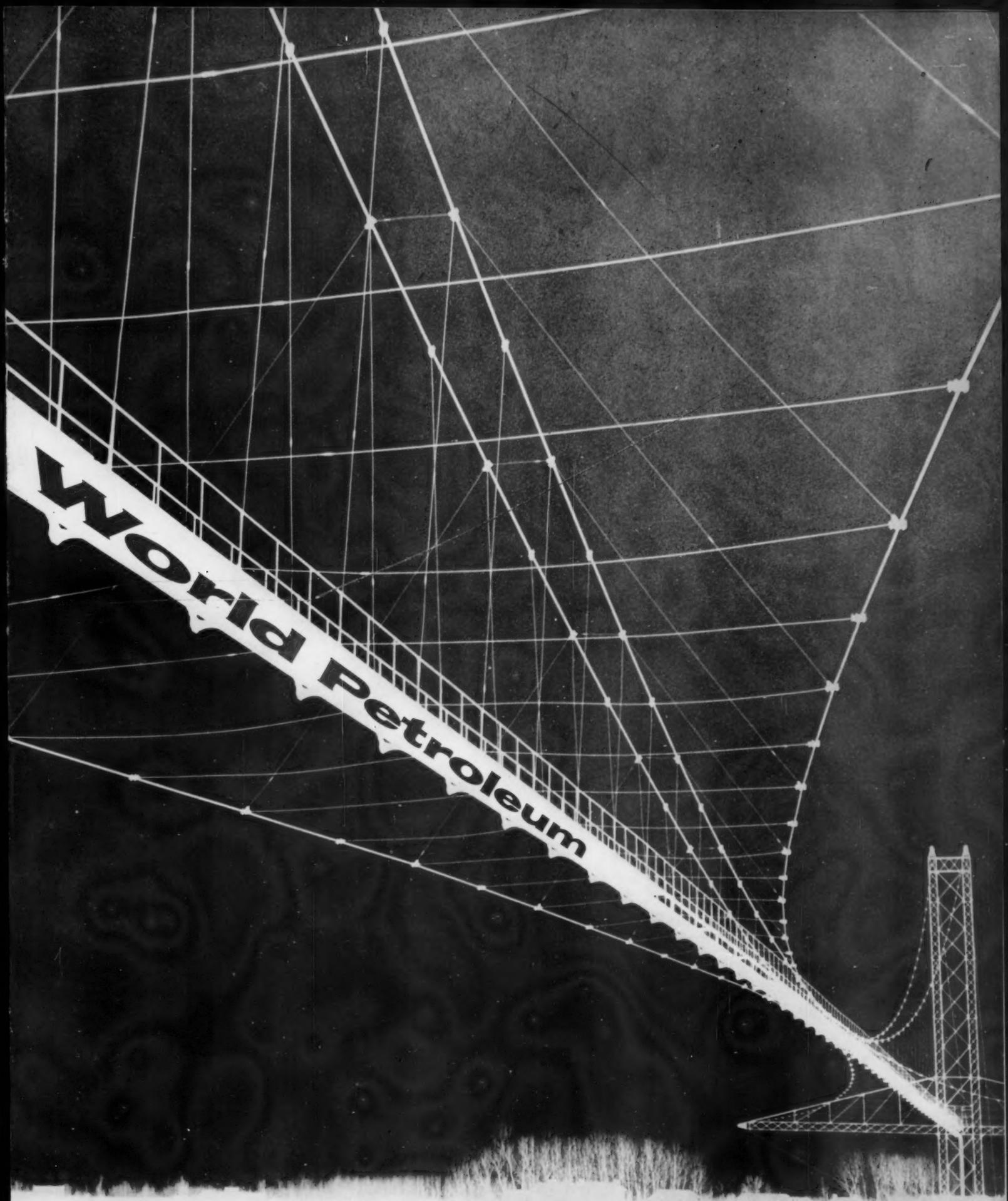

World Petroleum

AUGUST 1954

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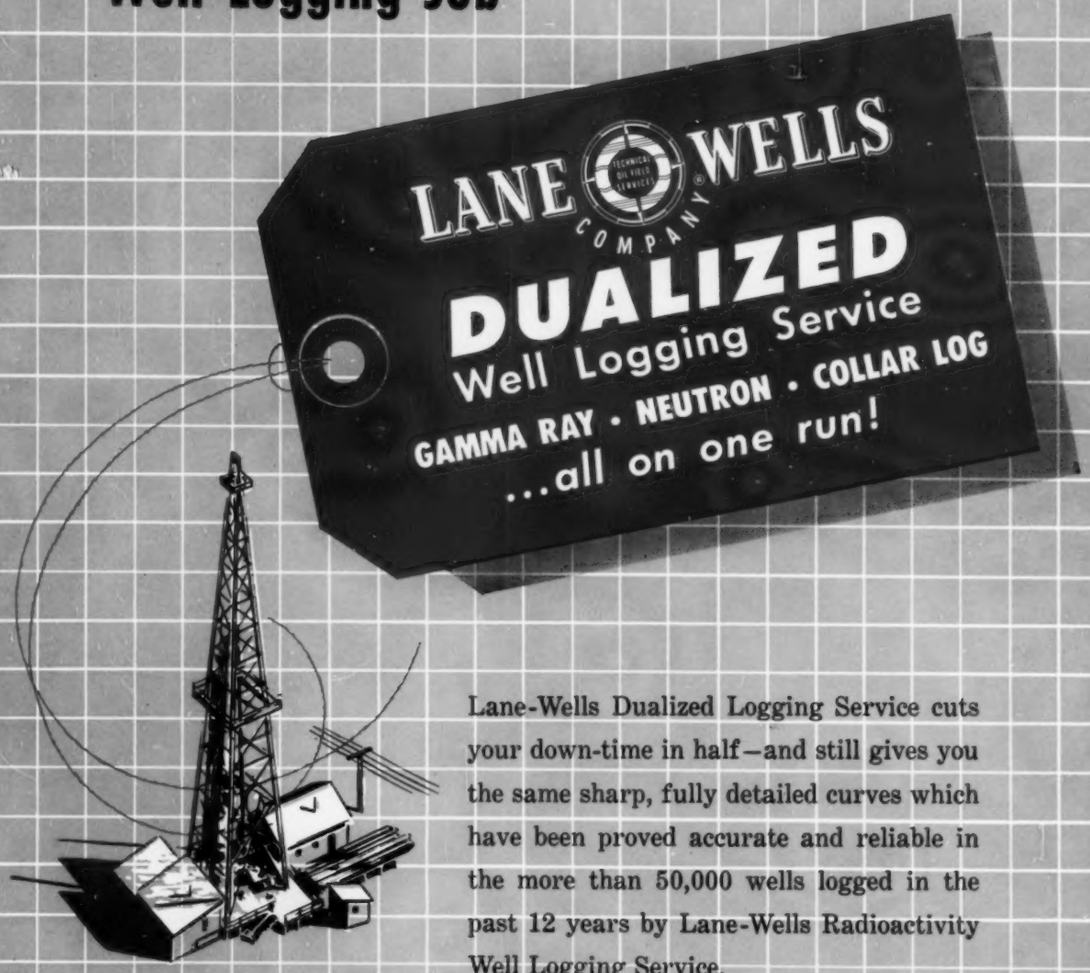

Lane-Wells Dualized Logging Service cuts your down-time in half—and still gives you the same sharp, fully detailed curves which have been proved accurate and reliable in the more than 50,000 wells logged in the past 12 years by Lane-Wells Radioactivity Well Logging Service.
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WORLD PETROLEUM for August, 1954. Vol. 25, No. 9, August, 1954. WORLD PETROLEUM is published monthly by Mona Palmer, Trustee under the will of Russell Palmer, 604 Fifth Ave., New York 20, N.Y. Authorized as Second Class Matter, P.O. Dept., Ottawa, Canada. Subscription rate: $5.00 per year, single copies $1.00. Copyright 1954, by Mona Palmer, Trustee.

REFINEMENT *IS THE* KEYNOTE

From THORNCLIFFE

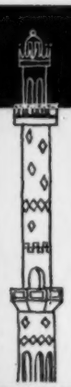
Across the world, discerning refinery and process engineers recognise the technical skill and craftsmanship which Newton, Chambers bring to the making of specialised plant. At Thorncliffe, whilst keeping abreast of tomorrow's trend in technique, we refresh ourselves constantly from a back-log of experience spanning 160 years, and more, of service in the engineering field.

This is a Stripping Tower for one of the Aden Crude Topping Units and has been constructed to A.P.I. A.S.M.E. Code. It has a diameter of 5'6", its overall length is 62'2", and it weighs 17 tons. (Photograph by permission of Messrs. E. B. Badger & Sons Ltd., and Anglo-Iranian Oil Co., Ltd.)

To ADEN

NEWTON CHAMBERS

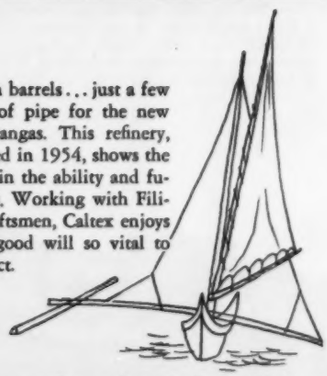
& CO. LTD. THORNCLIFFE Nr. SHEFFIELD, ENGLAND



BAHRAIN—The contrast of old and new in this colorful shaikhdom is shown graphically here. The Bahraini's lateen-rigged dhow, Bahrain's traditional fishing and pearling craft, sails gracefully through the waters of the Persian Gulf. In the background we see a modern refinery and Sitra Wharf where tankers take on refined oil products for delivery to markets halfway 'round the world.

NEW ZEALAND—Near majestic Mt. Egmont lies New Plymouth, largest city of Taranaki Province. This scenic land is the world's largest exporter of dairy products and lamb, ranks second in exports of wool. Caltex is proud to be a part of this scene . . . glad to help an enterprising country take its place in the modern world.

PHILIPPINES—Not gun barrels . . . just a few sections of the miles of pipe for the new Caltex refinery at Batangas. This refinery, which will be completed in 1954, shows the confidence of business in the ability and future of the Philippines. Working with Filipino engineers and craftsmen, Caltex enjoys the co-operation and good will so vital to such an immense project.



Caltex serves the people of 67 lands

In 67 lands, across half the world, through such developments as these, Caltex is able to supply better fuels and lubricants for industry, for agriculture, and for motoring millions. These require a continual investment of funds and skills, backed by a faith in a better future for free nations.

CALTEX

CALTEX Petroleum Products

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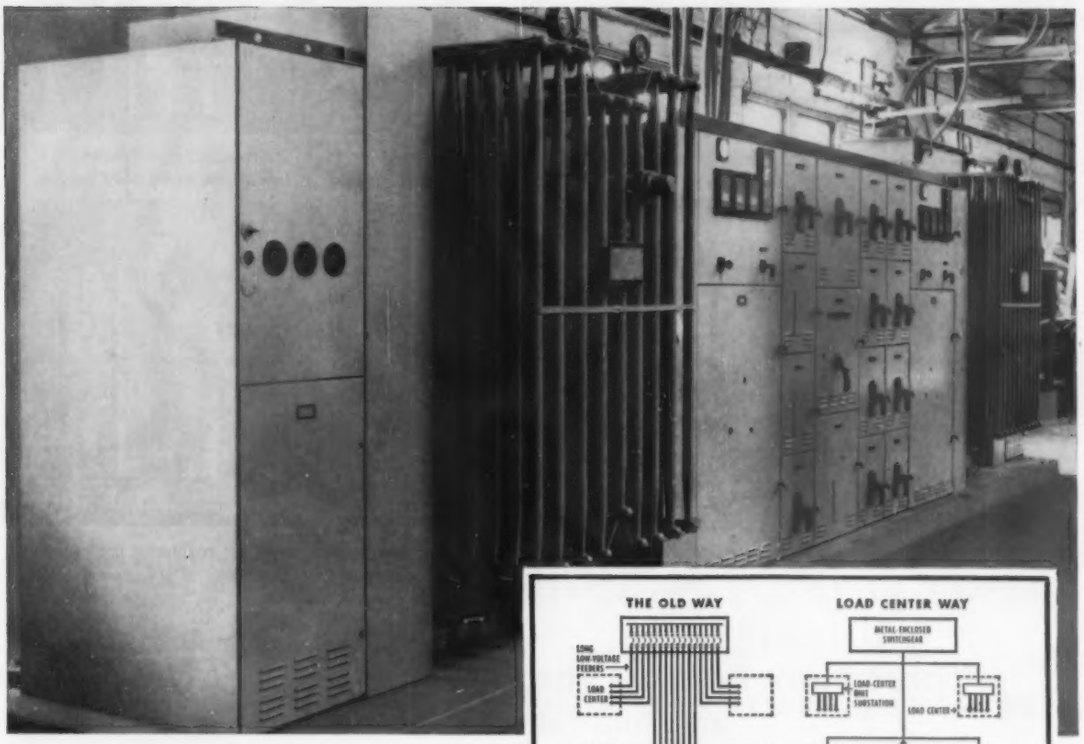
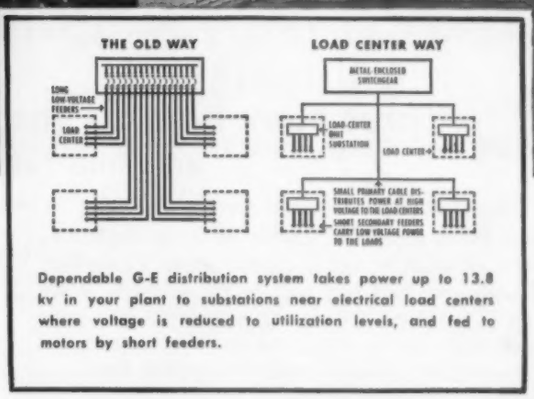
EXPANDING? PLAN NOW TO AVOID FUTURE SHUTDOWNS!

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SHORT SECONDARY FEEDERS CARRY LOW VOLTAGE POWER TO THE LOADS

Dependable G-E distribution system takes power up to 13.8 kv in your plant to substations near electrical load centers where voltage is reduced to utilization levels, and fed to motors by short feeders.

Standardized, Factory-Assembled G-E Substations Cut Power Failure Shutdown, SAVE UP TO 50%

• **MORE PROTECTION FOR MORE POWER!** Compact, metal-enclosed G-E unit substations have secondary-selective system for duplicate sources of power. Live-part metal enclosure and modern, high-interrupting capacity breakers protect production and personnel.

• **SAVES TIME AND MONEY!** You select a standard unit directly from G-E specifications. You get quick delivery, save time and money from initial planning to final installation. Compared with conventional systems, you can save as much as 50%.

• **IMPROVES VOLTAGE — SAVES COPPER — FLEXIBLE FOR FUTURE!** G-E packaged substations take high-voltage power directly to load centers. Long secondary circuits are avoided. Plant voltage improves. Extra copper is saved. The plant electric system now has great flexibility . . . additional substations can be added easily, quickly, economically.

For further information on G-E Substations, see your G-E representative. Or write International General Electric Co., 570 Lexington Ave., New York 22, N. Y., U. S. A.

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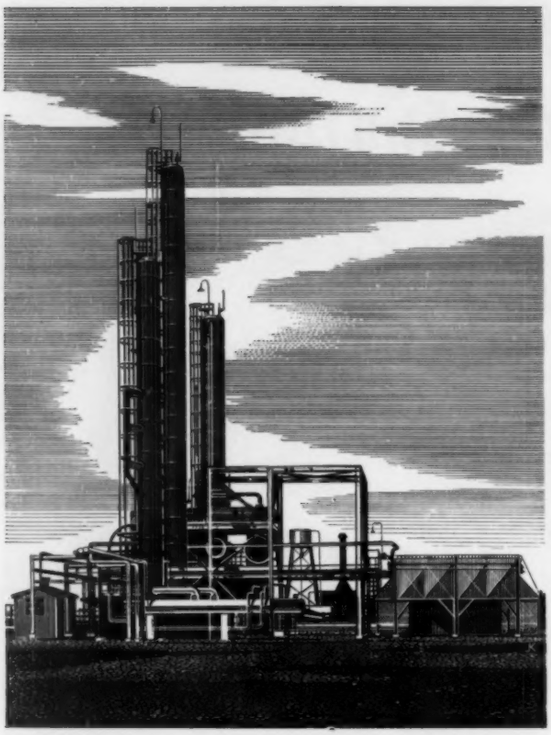
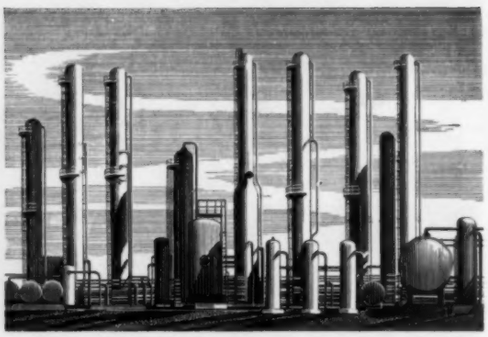
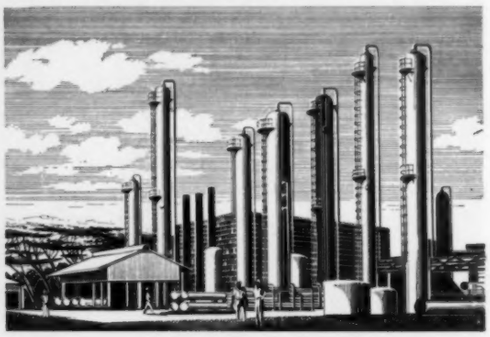


Located near Ballinger, Texas, the above plant (designed, engineered and constructed by Fluor for Runnels Gas Products Corp.) recovers 85,000 gallons daily of LPG and gasoline.



Built by Fluor, this natural gasoline plant for Warren Petroleum near Lovington, New Mexico, processes 22 mmcf/d.



Fluor designed, engineered and constructed this natural gas absorption plant, crude stabilizer and crude topping plant, Colombia, South America, for Colombian Petroleum.

Three more natural gasoline plants by FLUOR

BRINGING THE TOTAL TO 28

Fluor has an impressive record in the design, engineering and construction of natural gasoline plants. Twenty-eight complete units have been built by Fluor, ranging in size from 18 to 185 mmcf/d capacity, with several more under construction. Almost double that number of existing gas plants have been expanded and modernized by Fluor.

Fluor has built virtually every type of field processing plant – gas absorption, pressure maintenance, cycling, gas treating (aqueous, glycolamine, glycol dehydration, desulfurization, diethanolamine, etc.), plus innumerable compressor stations on gas transmission lines. Fluor manufactured products are used extensively throughout the Natural Gas industry. These include cooling towers, Fin-Fan air-cooled heat exchangers, pulsation dampeners, mufflers and gas cleaners for liquid and solids removal.

With headquarters at Los Angeles and a Mid-Continent Division in Houston, Fluor is conveniently located to provide an integrated organization for the design-erection of a complete gas-gasoline plant or any phase of it. Fluor's metal fabricating shops at Paola, Kansas, are well equipped for all types of structural steel and plate work, for the prefabrication of pressure vessels and piping. For more information on Fluor's qualifications in the Natural Gas industry, write for Bulletin FC-RC-0.004.

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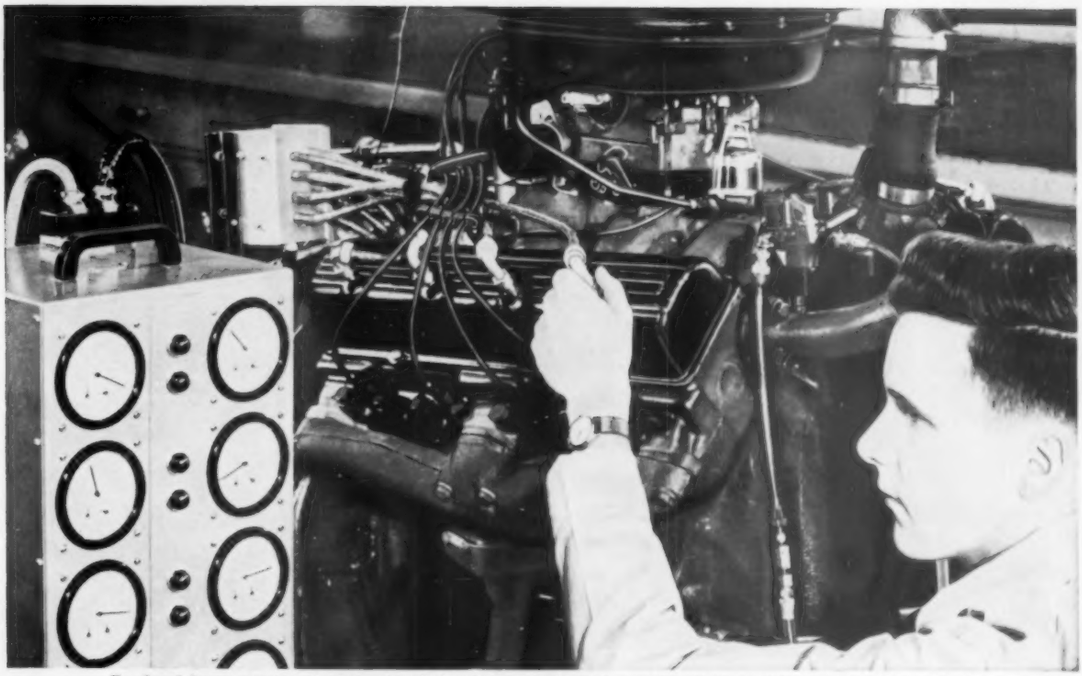
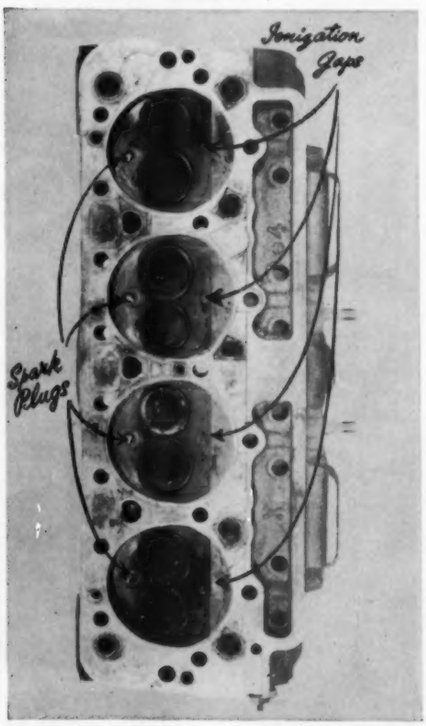


Preignition counter developed at Ethyl laboratories makes each cylinder tell its own story on preignition. It accurately records, for the first time, both audible and inaudible preignition in a passenger-car engine.

Multicylinder head shows how the ionization gaps are mounted in the Ethyl test engine.



ETHYL RESEARCH FIRES BACK AT PREIGNITION

New Ethyl-developed test instrument pinpoints flame frontiers

For years, the best minds in the petroleum and automotive industries have sought to find out what leads to preignition— the phenomenon that occurs when the gasoline-air charge is ignited in advance of the spark. Is the fuel at fault? Is the oil at fault? Is it the design of the chamber and its parts? Or is it a combination of all of them?

Ethyl Research Laboratories have been working on the problem of preignition for more than ten years. Recently they developed a new test instrument which for the first time enables researchers to find out when preignition—both audible and *inaudible*—occurs in a passenger-car engine.

First they mounted a series of ionization gaps—tiny spark plugs—in the head of a multicylinder test engine. Then they loaded them with a charge of electricity—but not enough to make a spark jump. When the ionized gas of a flame reaches one of these little plugs, current will flow across the gap. These "leaks," which indicate preignition flames, are recorded on a counter.

By correlating the results of this test work with other Ethyl research, new insight into the nature of combustion is being achieved.

ETHYL CORPORATION
Research Laboratories
1600 West Eight Mile Road, Ferndale 20, Michigan
2600 Cajon Road, San Bernardino, Californ ia

Premier's new 3000 barrel
UOP Fluid Catalytic Cracker

New Cat Cracker Placed in Operation By Premier

By R. P. Hargis, President
Premier Oil Refining Company of Texas
Longview, Texas

PREMIER Oil Refining Company of Texas recently completed a multi-million dollar expansion program at Fort Worth, Texas, making our refinery there one of the most modern in the entire Southwestern area.

R. P. Hargis

The expansion program was rounded out April 10 when a 3,000 B/SD UOP Fluid Catalytic Cracking unit of the latest design went on stream. It is designed to crack blended atmospheric and vacuum gas oils at a conversion rate of 74 per cent into gasoline having 92 clear research octane rating.

Installation of the cat cracker, with its attendant new polymerization and gas concentration facilities—all three of which were designed and licensed by Universal Oil Products Company—brings to six the number of major processing units in operation at the Fort Worth refinery. Others are a UOP Platforming unit, which has a design capacity of 1,500 B/SD, a thermal cracker, and a crude unit. With these facilities, the Fort Worth refinery has now become self-sustaining. Its supply of crude oil is piped from the Ranger Field into Fort Worth.

Four Reasons for New Unit

Four major factors motivated our thinking about installing a cat cracker less than three years after the company built the UOP Platforming unit. These factors were, in brief:

1. A cat cracker would enable Premier to make greater amounts of high quality finished gasolines; it would open up new avenues for marketing such products as butane-butylene; it would put Premier in the position of converting excess middle distillates into marketable products.

2. It would provide not only the Fort Worth refinery but Premier's other Texas refineries at Arp, Baird and Longview with a choice gasoline blending stock having an F-1 leaded octane number of 98 to 100.

3. It would further improve the refinery's economic position by making possible a larger gasoline yield from the crude run. The overall gasoline yield at the Fort Worth refinery was 52 per cent. It was estimated that with a cat cracker a gasoline yield of 67 per cent could be obtained—an estimate that since has proved to be accurate.

4. A cat cracker would permit operating the refinery at its crude oil capacity of 7,500 B/CD.

Coincident with the unit going on stream, Premier launched an intensive newspaper, radio and TV advertising campaign to introduce its new "Ignition Controlled" ethyl gasoline and "Dynamic" regular gasoline. We are now producing a 95 octane premium gasoline and an 86 regular motor fuel to meet the ever-increasing demands for higher quality gasolines in our trade territory.

We supply approximately 100 independent jobbers and more than 600 retail outlets in an area extending from Shreveport, La., on the east to Abilene, Texas, on the west, and from the Red River on the north to the central portion of Texas on the south.

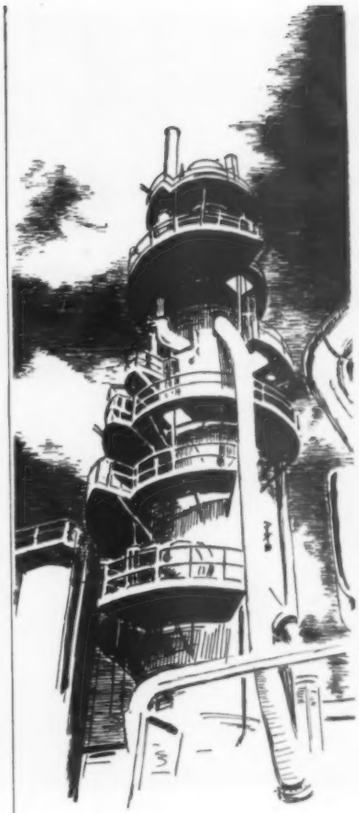
Octane Ratings Increased

Gasoline from the cat cracker is being transported to the Arp, Baird and Longview refineries for use as blending stock. This enables these plants to increase their octane ratings, and puts them in a more advantageous position to meet changing market conditions.

One of the unusual features of our new cat cracker is the placement of the reactor-regenerator on a structural steel skirt instead of having it mounted on a concrete base. Another interesting feature is the suspension of the air heater beneath the regenerator.

All of the pumps and the gas compressors are located under a reinforced concrete structure extending across the battery area parallel to the line of towers. Most of the heat exchangers, surge drums and receivers are placed on the roof of the concrete structure. This arrangement makes for compactness and maximum utilization of space, and enables our operators to control the unit with ease.

With the cat cracker now on stream, we are confident that the Fort Worth refinery is equipped to meet a wide variety of marketing conditions more profitably and with a greater degree of flexibility than was ever possible before.



PREMIER
INCREASES
GASOLINE YIELD
WITH UOP
FLUID CATALYTIC
CRACKING UNIT

designed, engineered and licensed by

UNIVERSAL
OIL PRODUCTS
COMPANY

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DES PLAINES, ILL., U. S. A.
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Universal Service
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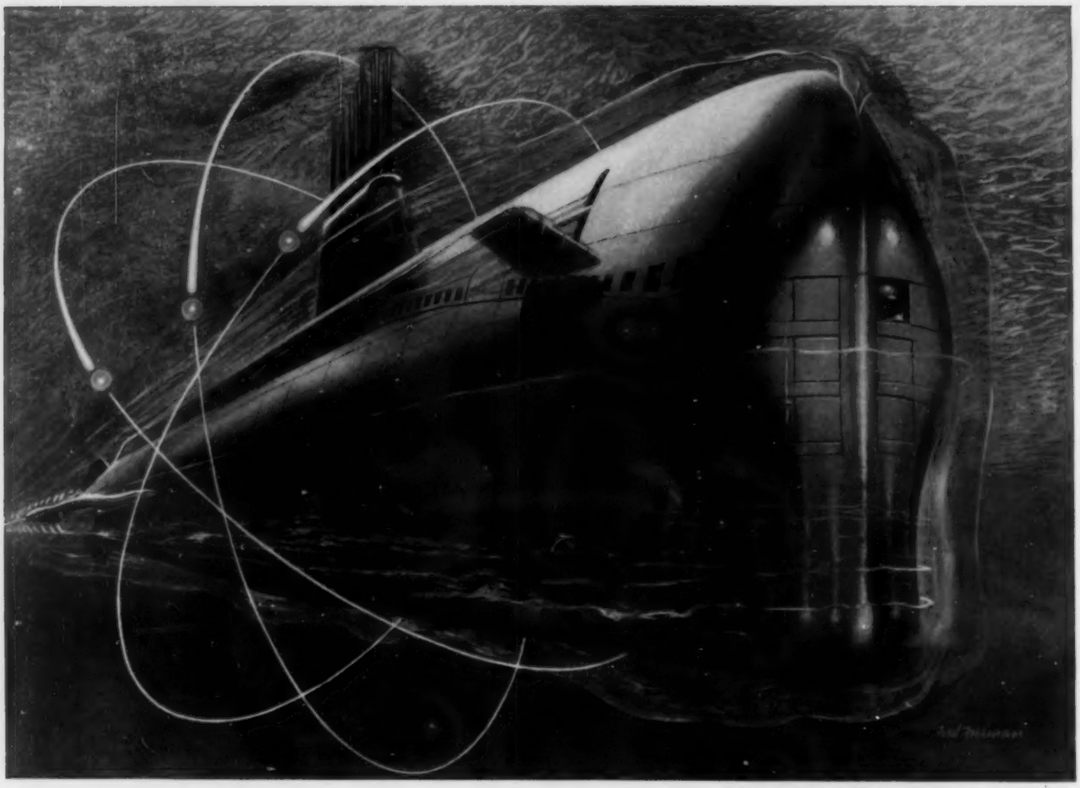

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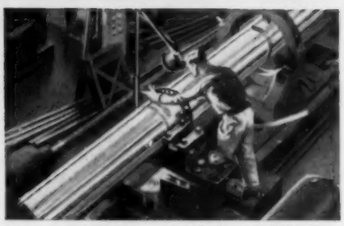

A snorkel intake tube being machined to very precise tolerances on one of the large lathes in the Groton plant.

AFTER 54 years of building over 300 "conventional" submarines for the U. S. Navy and our allies, Electric Boat Division, General Dynamics Corp., marks its entry into the atomic age with the launching of the "Nautilus"—world's first atomic powered submarine.

Electric Boat, with its sprawling foundries and shops along the Thames River at Groton, Conn., is really many industries in one. It casts its own metals—both ferrous and non-ferrous. It shapes and machines metal parts—from thick armor plate to parts with microscopic tolerances. It has 27 overhead cranes, marine railway and land railroads, a fleet of trucks, low- and high-pressure compressors, its own Diesel power plant.

This wide variety of costly machinery represents almost every lubrication condition found in modern industry. That is why Electric Boat relies 100% on Gargoyle lubricants and a program of Correct Lubrication—has done so for 34 years.

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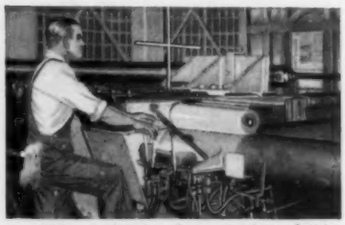
You can give your plant, mine or mill this same unsurpassed protection. Just call your Socony-Vacuum representative.



Hydraulic bender shapes section of 8-in. steel pipe in two minutes. This operation formerly took a full day.

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We never dreamed... that the oil industry would respond so enthusiastically to our introduction of the "Royal Scintillator." We were caught with our production down. We not only did not have enough instruments to supply the demand, we didn't even have enough catalogs. We apologize and wish to assure our customers that we are now in a position to give prompt service.

Not everyone agrees that the radiation survey technique is a proven method of oil field exploration. We agree that not enough data is available as yet, however, there is a growing body of opinion which holds that this is a valuable technique. Recent very encouraging results support this opinion.

We cannot guarantee that the Model 118 Royal Scintillator will locate oil, but we can guarantee that the Royal is the best instrument made for investigating the radiation pattern existing around oil fields. It is also the best instrument made for uranium prospecting, and its use for this purpose should not be overlooked by oil geologists.

Write now for our free pamphlet on "The Principles of Oil Field Detection with Scintillation Counters" and our complete catalog on Geiger Counters and Scintillation Counters.

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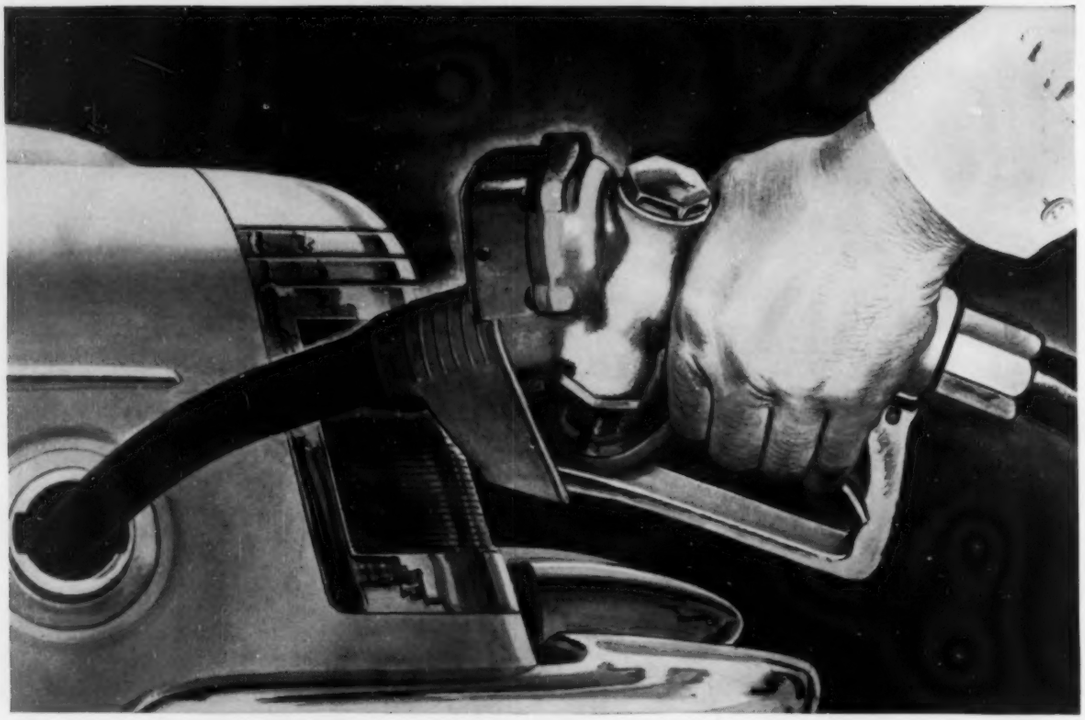

In the fondly-remembered time of the nickel trolley and the 25¢ T-bone, gasoline for dad's 1925 model cost about 18¢ a gallon (excluding taxes). Sounds like a bargain—yet it really cost *more* than today's gasoline. The reason is clear when you keep this fact in mind: You fill your car's tank with gasoline, but what you're actually buying is *mileage*. Naturally, you'd rather pay $1 a gallon for gas that gave you 100 miles a gallon than buy 10¢ gas that delivered only 5 miles to the gallon. And that's why today's gasoline costs less than motor fuel of 1925 . . . it gives you *more miles to the dollar*. Research by companies such as Standard Oil Company of California has improved gasoline spectacularly over the years. This better motor fuel made more efficient auto engines possible, and together they give you up to 50% better mileage than motorists got in the '20's. On top of that, competition between oil companies has helped to hold down gasoline prices. Since 1925, they've risen only 20% (excluding taxes) while food has gone up 70%, clothing 63%, and the cost of living 53%. Compared to practically anything else you buy, gasoline is still a bargain. Any way you look at it, your money goes further when it goes for today's finer gasoline that gives you more miles to the dollar.

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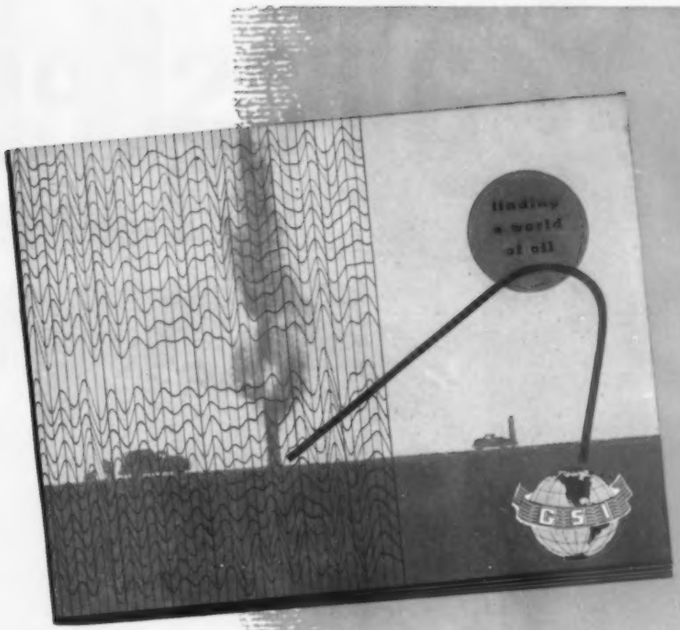

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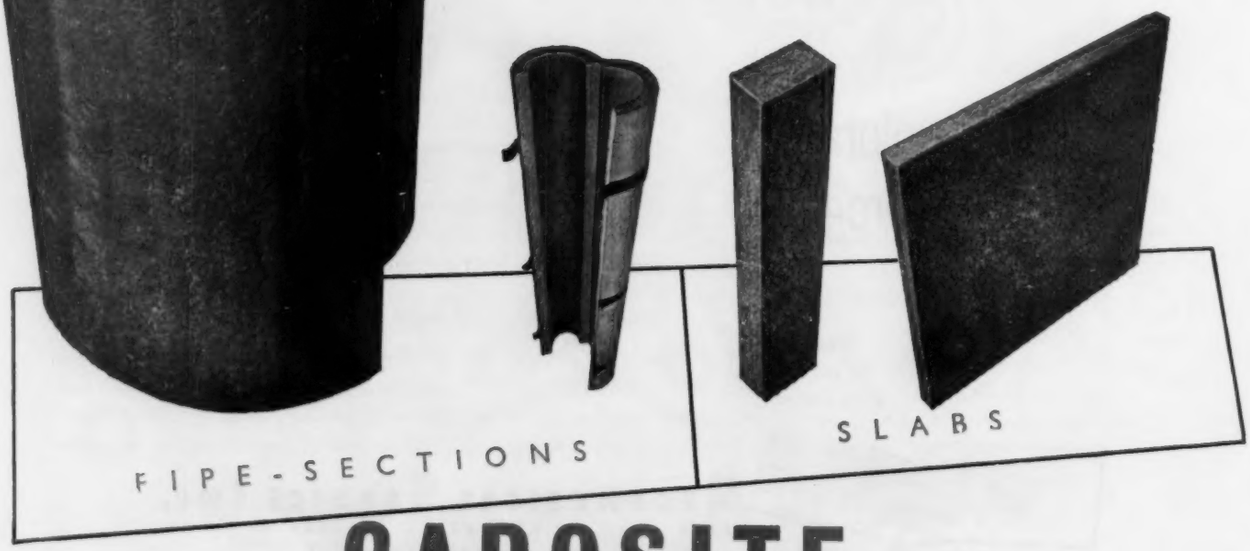
CAPOSITE insulation is not just all-asbestos. It is *all-amosite;* amosite being the uniquely long-fibred asbestos—from the Cape Asbestos Co. Ltd's own mines—which makes possible CAPOSITE'S particularly open, cellular texture. This texture gives it a level of thermal insulation which saves over 98 per cent. of uncovered hot surface losses, plus a resistance to the severest conditions of steam heat which enables it to maintain this efficiency almost indefinitely. CAPOSITE pre-formed pipe-sections and slabs are extremely strong, yet light and easy to fit; non-corrosive; and exceptionally economical. Write for full details.



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OIL
MUST BE DISCOVERED

Papuan members of an SSL seismic crew man-handling specially conditioned equipment through the jungle of PAPUA.

South and east of the island of New Guinea (in the South Pacific Ocean) is the Australian Territory of PAPUA. The typically heavy tropical rains of the region keep its dense jungles steaming. Mangrove roots and heavy matted foliage make physical movement of man very difficult. This tropical country of some 90,540 square miles is still wild and sparsely inhabited. There are no roads. Water and air travel serve as the main lines of communication with the outside world.

Prospecting for petroleum in PAPUA is only one of the extremely difficult assignments contracted for by Seismograph Service Limited. Drawing from the technical experiences of its world-wide associate companies—Seismograph Service Corporation, Tulsa, Oklahoma, U.S.A., SSC of Canada, Venezuela, Mexico and Colombia—and at the same time compiling the specialized know-how and experience from its own assignments, Seismograph Service Limited is prepared to undertake seismic exploration under even the most difficult of conditions.

Seismograph Service Limited

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KNOWLEDGE
a power for good

The Standard-Vacuum organization is continually expanding its educational and training programs for its 40,000 employees in the various areas where it operates.

In Indonesia, for example, 71 formal training courses as well as on-the-job instruction are giving several thousand men new skills . . . teaching them to work as a team and to produce more . . . improving their ability to shoulder responsibility . . . adding to their economic security as individuals and their economic strength as citizens.

Stanvac seeks to do its part in developing the capacities of its employees so that they become better qualified to carry on the company's operations and to participate in supervisory and administrative functions.

Greater knowledge is truly a power for good.

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PETROLEUM CHEMICALS DIVISION NEWS

DU PONT REG. U.S. PAT. OFF.

August ★ One of a Series of Interest to the Petroleum Industry ★ 1954

Research Paves Way for Production and Employment

Over the past quarter century, for every dollar Du Pont has spent for laboratory research, it has spent three dollars in productive facilities.

Research in the same period cost $475 million, exclusive of buildings and equipment. And employment soared from 38,000 to more than 90,000.

During the same span, expenditures for new plants and facilities amounted to $1,400 million. This is a ratio of three production dollars for one research dollar.

New Booklet on Du Pont Metal Deactivator

Many refiners are giving increased attention to the problem of the effect of metals on gum formation. To aid them in solving this problem, the Du Pont

Petroleum Chemicals Division offers a comprehensive new booklet which discusses the aspects of gum prevention.

The booklet traces the sources of metallic contamination. And findings of a recent service station survey on the prevalence of copper and gum in gasolines are included. There are also many helpful hints and detailed instructions on combatting gum formation with Du Pont Metal Deactivator.

Application and Costs

The booklet discusses methods of adding Du Pont Metal Deactivator and quantities needed to prevent metallic reaction. And it presents a cost study on the use of DMD. Other valuable information includes chemical reactions, handling and shipping. In all, there are 20 pages of facts with answers to practically any question you may have regarding the use of DMD.

The new booklet is yours on request from any Du Pont representative or regional office.

Mileage by the roomful to test automotive fuels and lubricants

How is gasoline efficiency affected by high-speed, high-temperature operation?

What happens to a lubricant in the hectic start-and-stop maneuvering through city traffic?

Questions like these become more important today as high-speed superhighways weave a network across the country, and the tangle of city traffic grows more knotty.

DEVELOPING FUELS AND LUBRICANTS FOR TOMORROW'S CARS calls for extensive road testing. To accelerate this work, the Du Pont Petroleum Laboratory has brought the highway indoors with this ingenious chassis dynamometer.

The new chassis dynamometer at Du Pont's Petroleum Laboratory gives interesting answers. It is an important source of information for the automotive engineers taking part in Du Pont's research concerned with additives designed to improve fuel and lubricant performance.

How It's Done

Speeds up to 90 mph can be simulated on the dynamometer. Radiator windage can be synchronized to the simulated speed of the car. Inertia flywheels create road conditions by varying "load."

Five flywheels can exert a load in multiples of 500 pounds up to two and

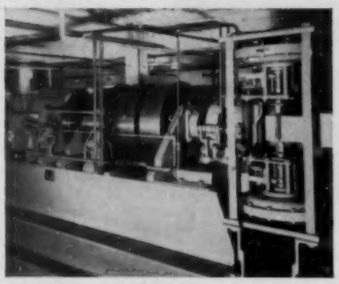
ADVERTISEMENT—Prepared for the Petroleum Chemicals Division of E. I. du Pont de Nemours & Company (Inc.)

OVER

PETROLEUM CHEMICALS DIVISION
NEWS

CONTINUED *Dynamometer*

three quarters tons. Engineers operate this versatile setup from a central control panel where detailed data on test factors are also recorded.



THE INERTIA FLYWHEELS, a useful feature of the Petroleum Laboratory's chassis dynamometer, simulate "load" on the car or truck being tested. The two large wheels on the right represent 2,000 pounds each, the next one is 1,000 pounds, and a 500-pound wheel is shown at the left.

THIS FAN is used to generate windage through the car's radiator. It allows the dynamometer to simulate actual radiator operating conditions, at speeds up to 90 mph.

Results

Information learned from tests in Du Pont's new chassis dynamometer will aid in matching vehicles, fuels and lubricants to the changing patterns of modern driving conditions.

As data from these tests are collected and evaluated, they will be made available to the petroleum and automotive industries.

Manager of New San Francisco District

JOSEPH G. EVANS

Because of increasing activity on the Pacific Coast, and as an added service to refiners, a new district has been created by the Du Pont Petroleum Chemicals Division's West Coast Region.

Assigned to the post as manager of the San Francisco District is Joseph G. Evans who joined Du Pont in December 1951.

Mr. Evans is a graduate of Texas A & M and started with Du Pont as a sales-service representative of the Petroleum Chemicals Division in Tulsa, Oklahoma.

Previous to this he was Development Engineer for the Standard Stoker Company of Erie, Pennsylvania, and later formed his own company handling specialized industrial chemicals and automotive lubricants.

Mr. Evans spent three years in the Pacific as an officer in the Naval Submarine Service during World War II. He was later recalled to active duty during 1950-1951 to serve on the destroyer U.S.S. McCaffery off Korea.

Du Pont additive improves diesel fuel production 4 ways

You may know Du Pont Fuel Oil Additive No. 2 as an effective stabilizer and dispersant for distillate heating oils. But do you also know that F.O.A. No. 2 does some remarkable things when added to diesel fuel?

It permits blending of cat-cracked and straight-run stocks. Refiners get more flexibility and greater capacity in diesel fuel production.

Certain amounts of heavy distillate fuel oils treated with Fuel Oil Additive No. 2 can be added to diesel fuel without affecting filterability. In this way the additive permits upgrading of heavy oils.

It reduces particle size of insoluble residues, and retards their formation as well. Result—F.O.A. No. 2 helps to end clogging of diesel filter screens.

The fourth advantage of F.O.A. No. 2 in diesel fuels is that, being ashless, it simplifies the problem of meeting ash specifications. Since it leaves no combustion chamber deposits, it does not contribute to exhaust sparks.

Storage tests indicate that this highly concentrated chemical additive gives most satisfactory results when added to freshly prepared stocks at the refinery.

LITERATURE AVAILABLE

Here is a partial listing of the bulletins, reports, booklets, technical papers and aids available to you through any of the Du Pont Petroleum Chemicals Division regional offices listed below:

Du Pont Fuel Oil Additive No. 2—A 12-page bulletin describing this ashless stabilizer and dispersant which prevents clogging of fuel oil screens . . . A-6522

Du Pont Metal Deactivator — A new, comprehensive, 20-page booklet which discusses every aspect of copper contamination and methods of metallic gum prevention using Du Pont Metal Deactivator, A-7300

Film Library — A new catalog, listing films which are available for oil company use. This listing includes the Du Pont "Cavalcade of America" TV library A-7549

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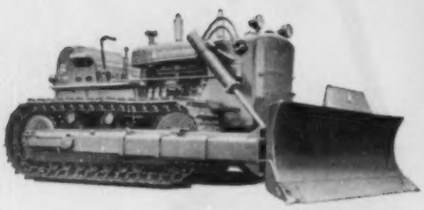
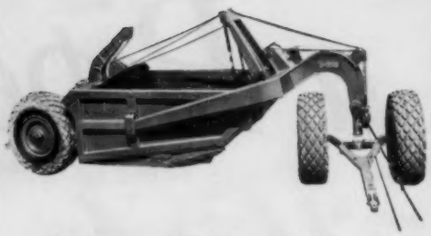
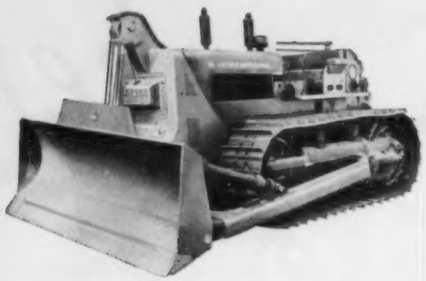


International TD-24 crawler tractor with hydraulic bullgrader



International B-250 four-wheel scraper for use with the TD-24 tractor



International TD-24 crawler tractor with cable tilt-dozer

International 2T-75 two-wheel rubber-tired tractor and 18 yard scraper

International TD-14A crawler tractor with hydraulic skid-shovel

International 2T-75 two-wheel rubber-tired ractor and bottom dump wagon

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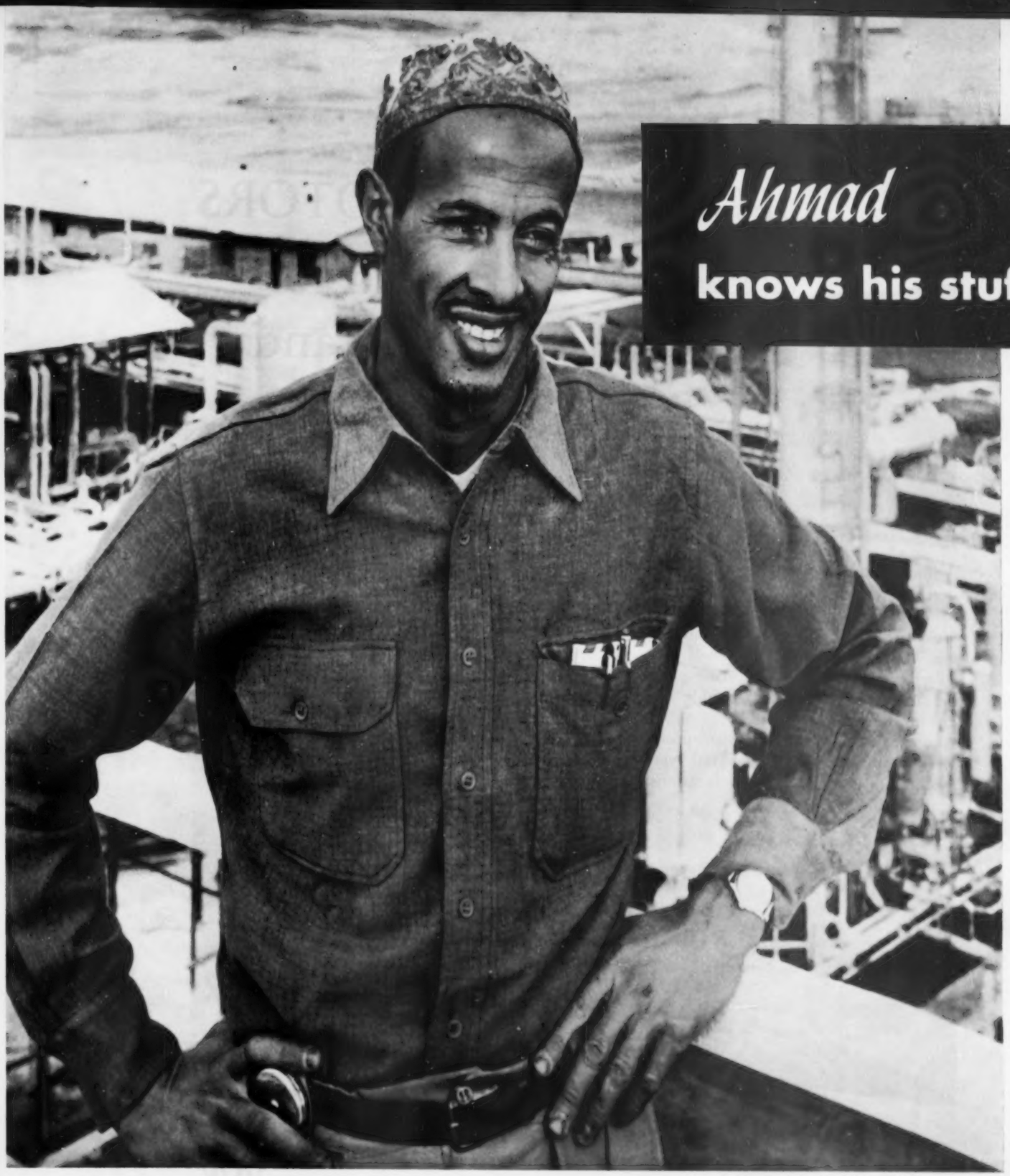

Ahmad knows his stuff . . .

Ahmad Isa al-Masalli is just the man for the instructor's post at the Dhahran stabilizer. He has 14 years of service with the Arabian American Oil Company. Now Ahmad passes on his wealth of technical knowledge to his Saudi Arab countrymen who come to work at the complex stabilizer.

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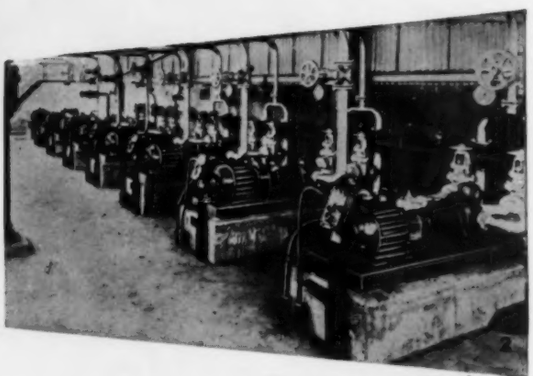

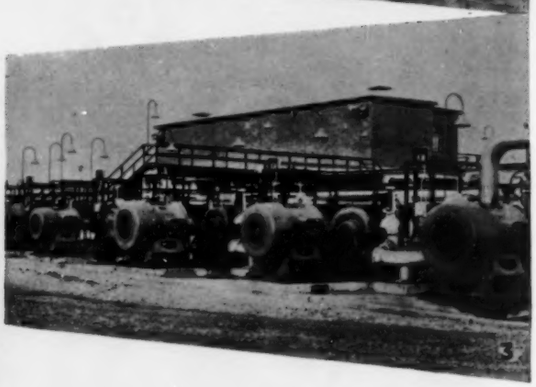

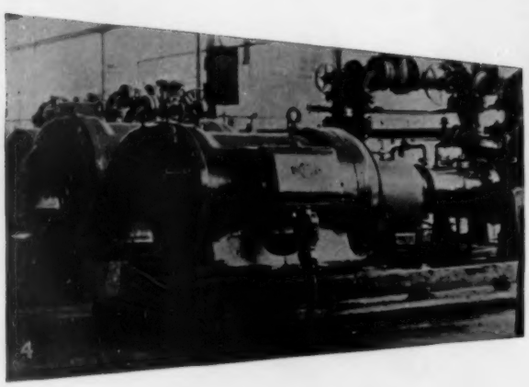

1. A range of flameproof motors in one of the main pumping stations at Scottish Oils, Grangemouth Refinery. 2. Type KFB flameproof motors driving Sigmund pumps at Shell Stanlow Refinery. 3. 300-600 hp outdoor flameproof motors at the product loading station at Esso Refinery, Fawley. 4. 125 hp 3500 rpm T.E.F.C. motors driving oil pumps at Trinidad Leaseholds Pointe-a-Pierre Refinery, British West Indies.

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The Ultraformer is designed to upgrade 7300 barrels per day of light fraction charge stock at 300 psig, producing gasoline in excess of 90 octane clear rating.

Pan-Am Southern had not believed it possible that the first unit of a new commercial process could be designed and built in so short a time. Their pleasure is expressed in this letter from Mr. R. T. Colquette, Vice-President. Lummus, too, is pleased to have served a good customer so well.

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P. O. Box 2—New Orleans 6, Louisiana

R. T. COLQUETTE
Vice President

June 14, 1954

Mr. C. A. Barrere
Vice President
The Lummus Company
2707 Weslayan Road
Houston, Texas

Dear Mr. Barrere:

Recognition of an outstanding record-breaking performance is always a pleasant duty.

The construction and completion of our 7300 barrels per day El Dorado Refinery Ultraformer by your company has been a remarkable achievement. On July 9, 1953, we authorized you, under letter of intent, to proceed with the engineering and purchasing of these facilities. On November 5, 1953, a construction contract was signed to construct the unit with certain bonus-penalty provisions for initial operations by July 7, 1954. At the time of our signing the contract, we did not think it physically possible for you to erect and start initial operations of the first unit of a new commercial process in 200 days. However, we were pleased to pay you 46 days bonus payment when you placed these facilities in operation on May 24, 1954.

After 20 days of continuous operation the unit has demonstrated completely satisfactory operability under the provisions of our contract, and this letter will serve official notice to you that as of this date we are taking over operation of this unit -- subject, of course, to the usual continuing guarantees of materials and equipment.

Please extend our sincere compliments to all of the members of your organization who worked on this project for a job exceptionally well done.

Yours very truly,
R. T. Colquette

R. T. Colquette

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VOL. 25, NO. 9 AUGUST, 1954

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THIS MONTH'S COVER

River crossing of the Cortemaggiore-Turin gas line in Italy. The line crosses the Ticino river several times. Photograph by Publifoto, Milan.

Samson

OF THE BIG FRAC

Giants roam the earth these days . . . Samsons of horsepower whose great strength is harnessed to a new production improvement technique. This process is called the "big frac", field-name for high volume formation fracturing. Halliburton pioneered this important service. For over five years Halliburton's huge red and silver fracturing equipment has been a familiar sight in the oil fields. It set a remarkable record—3 out of 4 wells fractured have increased initial production, obtained a more favorable PI, and improved sustained production. This success has come not only from proper equipment but from wide experience as well—priceless experience on more than 35,000 fracturing jobs that is Halliburton's alone. Knowing when, where, and how to use the Samson of the big frac make Halliburton first choice for this important production improvement technique.

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PERPETUAL PROGRESS IN PRODUCTION IMPROVEMENT TECHNIQUES

World economy gains

REPORTS FROM OFFICIAL BODIES and financial organizations dealing with international trade and monetary conditions agree in recording a notable improvement in the economic position of many countries throughout the free world. Some of these reports deal with developments during 1953 when definite results from activities set on foot during the past several years began to appear. Statements dealing with current operations during 1954 show that this movement is continuing at an accelerated pace.

The significance of this accumulating information lies in the evidence it affords that world trade is working back toward a more normal basis than it has had at any time since the end of World War II. Countries that seemed hopelessly in the debtor class have increased their industrial activities and thereby have improved their relative position. The imbalance that resulted from the war and the sharp rise in commodity prices that temporarily stayed the course of the movement following the Korean outbreak is gradually being smoothed out. The inflationary trend has been checked and the currency position, fortified by larger reserves, is stable and improving.

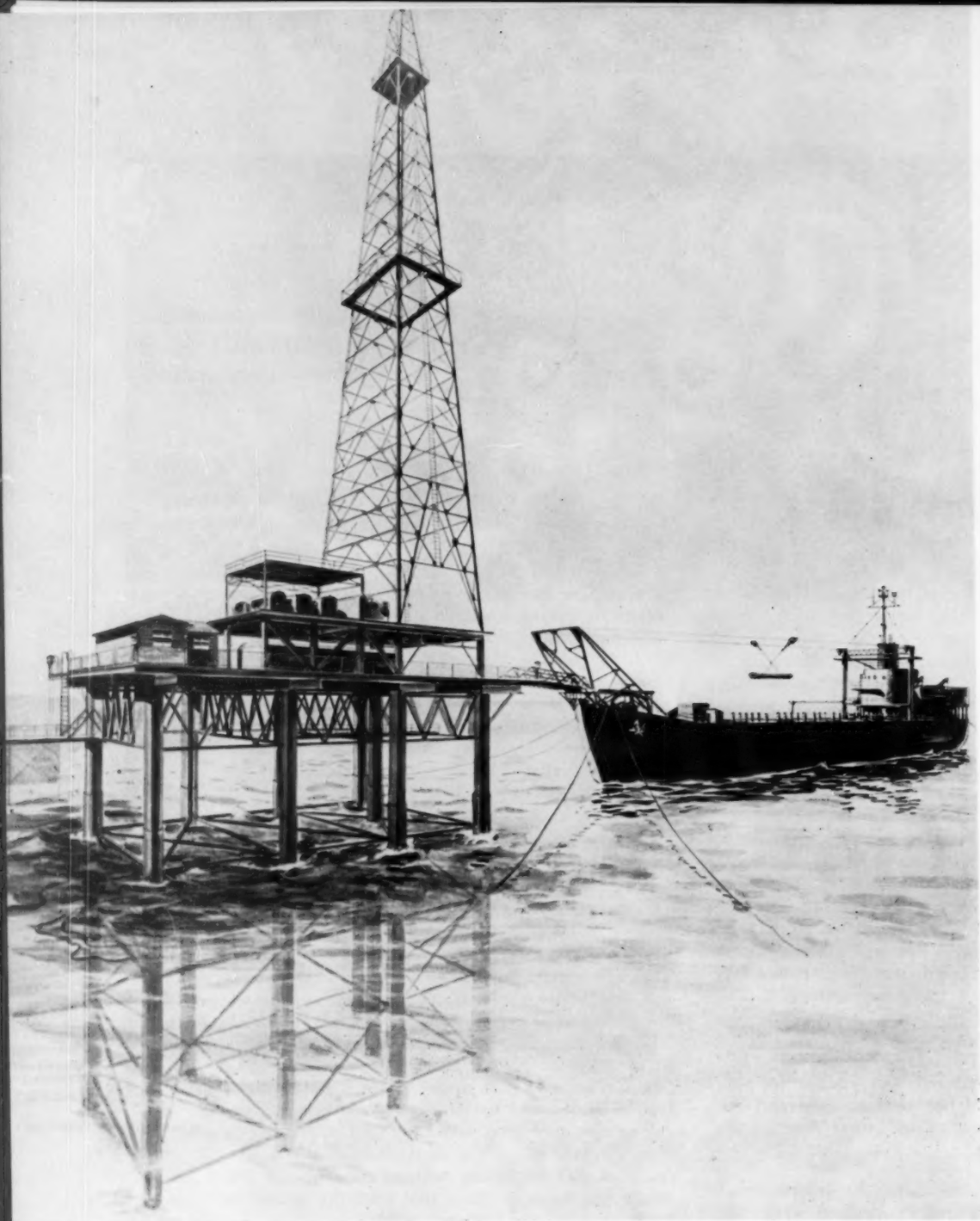
Earlier this year the Bank for International Settlements issued a report dealing with the changes taking place in Western Europe and indicating the steady approach of the time when free exchange of currencies could be established. The same trend appears in the monthly statements of the European Payments Union which show a gradual evening off in the position of its members. The basis of European improvement is indicated most clearly by the rise in the index of industrial activity in the past five years. This is most remarkable in the case of Germany and the Netherlands, but is strongly in evidence in the United Kingdom, Belgium, France, Italy and in other countries less affected by the war as reflected in reports for the first half of 1954.

Throughout the sterling area, which is more or less affected by the position of the British pound, improvement in trade activity is general. In the countries historically geared to the British monetary system and in the members of the Commonwealth overseas, industrial activity is in high gear with particular attention directed to development of their petroleum industries. In South America the need for utilization of dormant natural resources has led in several countries to the adoption of a more liberal attitude toward outside capital and enterprise with improved prospects for their exchange position. Reports from independent observers in Mexico are that the economic outlook has taken a definite turn for the better despite the temporary flurry caused by the unheralded devaluation of the peso.

One factor contributing to a more confident feeling in other countries undoubtedly is banishment of the fear of a severe American depression. The widely publicized predictions of a sharp economic setback and a prolonged business depression, freely expressed by professional forecasters in the United States and reproduced abroad, sometimes in exaggerated form, naturally were alarming to businessmen. When it came to be realized that the United States was not threatened by panic or involved in depression, and that its annual investment of billions in the expansion of productive facilities was continuing without interruption, the strain was relieved. Since that time the upturn in trade activity has been noticeable.

The net effect of the change in the world economic situation is summarized in recent reports that trade among the three great territorial divisions, North America, Western Europe and the sterling area, generally has increased, that price relationships are more normal and that the dollar shortage has been substantially ameliorated. Incidentally, it may be mentioned that the latter position has been strengthened by the addition of $2,600 million to the gold and dollar reserves of countries outside the United States.

To these observations it may be added that the competitive situation has been strongly re-established in international trade and needs only the adoption of full convertibility to make the picture of normality complete.



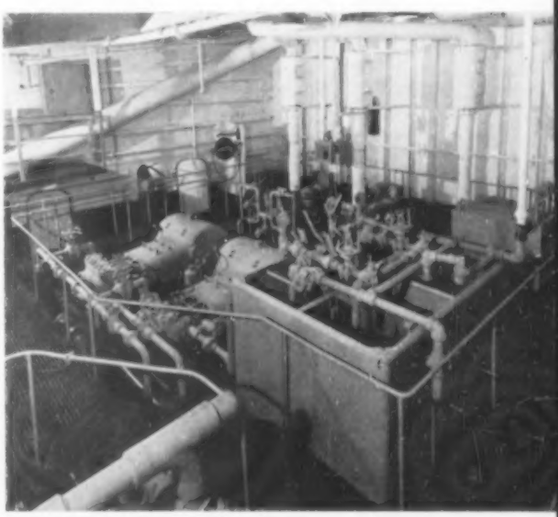
Artist's sketch of Gulf's drilling tender, platform, derrick and rig designed to show the tramway pipe-handling equipment in operation and the relative position of the various elements of the drilling team.

Tests $3 million offshore lease

Gulf Oil Corporation is drilling in 65 feet of water in the Gulf of Mexico from a permanent platform with an auxiliary tender converted from a wartime LST to service as a supply ship and floating hotel

Office of the drilling superintendent aboard the M. V. Eagle. The drilling superintendent is the ranking officer in charge of the ship, the drilling platform, and the operations. His office overlooks the platform.

The M. V. Eagle's recreation room, which is equipped with television receiver, AM radio, card tables and motion picture projection equipment to provide diversion for off-duty crewmen.



Halliburton cementing equipment in the forward hold which pumps mixed cement to the drilling platform.

AN INCREASING TEMPO is marking the exploration of one of the last petroliferous frontiers of the United States. Halted for more than three years by the controversy between the federal government and the coastal states, offshore work now is gathering momentum again.

Drilling has begun on state leases purchased last December and oil companies are filing lists with federal authorities of the lands on which they wish to bid when the continental shelf is opened for leasing this fall. The tidelands and continental shelf now thrown open to exploration greatly exceeds in area the rich onshore belt, where wildcatting has been successful since the dawn of the gasoline era.

In the half century since the discovery of Spindletop, the oil industry has prospected a strip of 9,500,000 acres of coastal lands underlain by Miocene formations. The search has been rewarded by the discovery of 100 structures of which 62 will produce more than 20 million barrels of crude. Of these, 29 are classed as major fields, each of which will have an ultimate recovery of more than 50 million barrels. Eleven of the major fields eventually will produce more than 100 million barrels each.

Offshore from this rich producing area between the Rio Grande and Mississippi Rivers are 15 million acres of lands underlain by Miocene and Pliocene formations which are submerged by less than 150 feet of water. In a recent press conference, Ben C. Belt, vice-president of Gulf Oil Corp., said that a spirited offshore wildcatting and development campaign could easily uncover four to six billion barrels of new oil reserves in the next five years. In addition, some 15 or 20 trillion cubic feet of gas may be discovered in the area.

Mr. Belt points out that thus far only about 10 percent of the offshore acreage between the Mississippi and the Rio Grande has been leased to about 25 operators. He estimated that 10 to 14 companies already have spent $2.5 to $3 million each on geophysical exploration and from $2 to $10 million each on drilling equipment.

Thus far, offshore drilling on the limited acreage tested has developed 14 fields producing 25,000 barrels of oil daily from 118 wells. Most of the 12 gas fields discovered are shut in. Current drilling involves 18 development and eight wildcat wells. Since Mr. Belt gave these figures two wells have been completed which indicate new discoveries.

Gulf had invited news and trade journal men to Corpus Christi to inspect a drilling platform erected 8½ miles offshore from Mustang Island near Corpus

Helicopter on specially-constructed heliport on fantail of drilling tender M. V. Eagle. The port will accommodate the largest commercial helicopter currently available. The planes will be used for ship-to-shore transportation of men and materials.

Christi in the Gulf of Mexico in 67 feet of water. The operation is being conducted in the deepest water thus far attempted.

Gulf's lease covers 5,760 acres of submerged lands for which the company paid the state of Texas a bonus of $3,065,880 last December. Other companies paid an additional $1,673,280 for six tracts offsetting the Gulf lease.

Offshore exploration is a blue-chip operation in every respect. Since public land is involved, lease bonuses will be high.

First big sale of Texas offshore leases last December brought the state a total of $32.4 million in lease bonuses. Average per acre bonus was $78. Gulf's bid of $532 per acre for the tract near Mustang Island was the largest submitted. Nine tracts brought $1 million or more.

Reconnaissance and drilling operations, because of the keen competition existing in the industry, also are far more expensive than on shore, with the result that only major fields will show a profit. In his talk with newsmen, Mr. Belt remarked that "the finding of an oil field in the Gulf with an estimated ultimate yield of 10 million barrels will be a failure, and such an oil field will have to be handled as a fisherman handles a 'non-keep' fish — merely thrown back into the sea."

Weather conditions become an important factor in the cost of drilling in the Gulf. This is particularly true during the periods of rigging up and completion. Hurricane seasons in spring and fall will cause expensive interruptions.

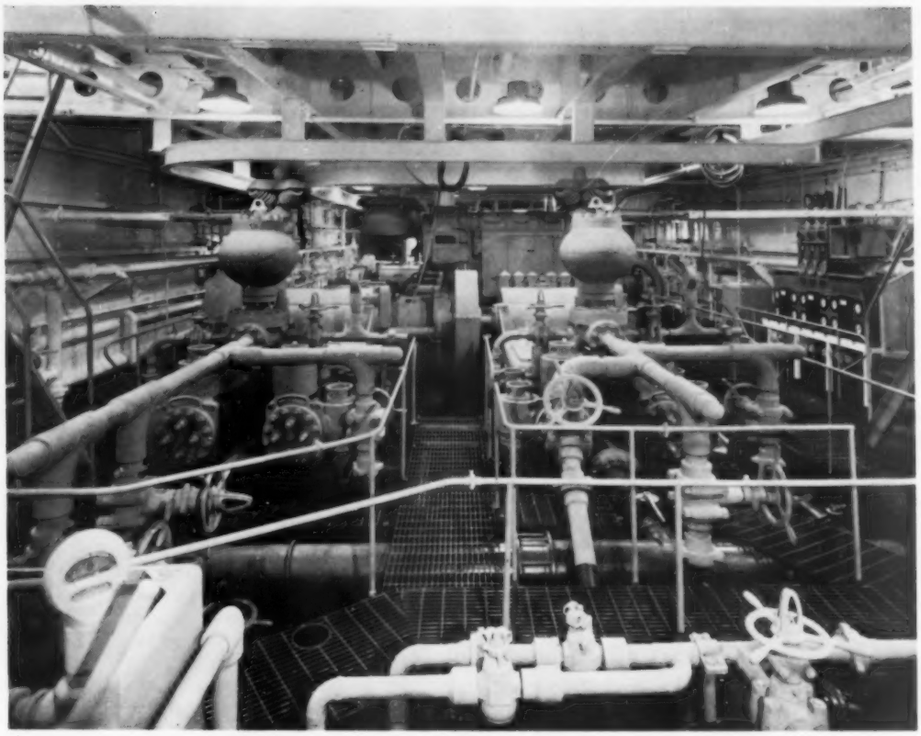
The effect on operations of extended winds of much less than hurricane force was observed by Gulf on its present offshore wildcat. Out of 90 days after the rig was erected, work could not safely be conducted during 60 days because of high waves. Early in June, 12-foot waves were running, making hazardous the transfer of men and materials from tender to platform or from crew boat to tender.

The demurrage on a drilling tender, drilling platform and drilling rig is approximately $4,500 per day. Thus the operator's only hope of making any money in this kind of operation is to keep his rig busy when he discovers an oil field and develop it immediately and vigorously in order to make 100 percent use of his expensive facilities, Mr. Belt observed. "It is probably true," he said, "that if the federal government fails to put this land up for lease in large quantities so that operators can make big plans for equipment to explore and develop it, that most people will go broke by merely paying the demurrage on their equipment or else they will never build adequate equipment to get into the exploration business at all.

"The operators feel that they have a chance to make some money if they can find a major oil field, provided that they can own it under existing tax laws and provided the royalties are not made much more than ⅛.

"A great deal of study of hypothetical conditions under which an oil field will be developed and the oil produced after it has been developed has been made and it would appear that an operator who finds a major oil field can make some money out of it (much less than he would make from an equivalent oil field on land). But there are one or two unknown quantities which make the possibility of large profits seem somewhat uncertain. Among these uncertainties is the fact that we do not know in terms of operating a drilling rig and in terms of producing the oil after the wells are drilled how many non-operating days there will be in a year as a result of high seas.

"These non-operating days will mean days when demurrage runs against expensive drilling and producing equipment and high-priced personnel. Of course another element of uncertainty in the offshore gamble is whether or not sands known on shore persist beneath the offshore structures. Still another element of uncertainty is the producing characteristics of the sands. There probably will be sands the character of which may not permit them to be produced at even the conservative allowable rates which are maintained in Texas and Louisiana today."



Mud pump equipment in the hold of the M.V. Eagle consists of two 750 hp diesel operated pumps capable of handling 900 gpm each and one 550 hp pump for mixing and transfer.

Mr. Belt pointed out that the offshore sands are younger and softer and hence may give sanding trouble.

The equipment required offshore is tremendously more expensive than that for drilling on land. It seems likely also that present methods and equipment will become obsolete quickly.

The present accepted way of drilling a well on the continental shelf is to build a platform 40 feet above the wave action by the templet and piling method. The platform is large enough to carry the derrick, engine and draw works, and the crew is quartered on the drilling tender. The drilling tender likewise carries mud pumps, mud pits and has ample room for warehouse space.

A platform suitable for drilling in 60 to 80 feet of water costs approximately $450,000, a typical drilling rig $550,000, and the drilling tender approximately $2,500,000.

Both oil and equipment industries are studying methods of improving on the platform. A half dozen or more ideas are either in the blue-print stage or under construction. Object of most of these is to develop a platform which can be towed to the drillsite and fixed in place by submerging part of the structure. Present platforms have very little salvage value and it is the aim of the designer of portable platforms to be able to float the rig to a new location after drilling is completed, particularly if the test is a dry hole. Most successful wells will require a permanent platform during the life of the operation.

One portable drilling barge now is operating in the Gulf. It is the DeLong barge which moves to the drill site carrying its own supporting caissons. Once on the drilling site, caissons are lowered to the ocean floor and the barge is raised upward on the supporting members to a point where wave action cannot interfere with operations. At least one other portable barge capable of drilling in water up to 100 feet in depth is to be ready for testing later this year.

Gulf Oil Corporation's new platform is a 48 by 106-foot structure built by Brown and Root of Houston. It consists of a "jacket" prefabricated on shore, towed to the drillsite and lowered into position in the water. The jacket is constructed of eight strongly braced vertical cylinders long enough to reach from the floor of the gulf to 30 feet above the water level. These cylinders serve as guides for 30-inch steel piles which are driven into the ocean floor. Piles are cut off at 48 feet above mean low water level and the deck welded on.

Platform equipment consists of a 140-foot Lee C. Moore derrick, a National 130 drilling rig, a generator and standby mud pump and tank for emergency use. The stand-by equipment would be used to maintain circulation in case the tender were to be disconnected and moved.

Lee C. Moore designed a special substructure which permits the entire rig to be installed in two lifts: derrick substructure and engine foundation. This was considered desirable because of the need to rig up quickly during favorable weather when seas are calm.

Gulf has built two tenders thus far for offshore work. The first to be commissioned is *The Eagle*, a 2,600-dwt. U. S. Navy LST converted for Gulf by Bethlehem Steel Co. The second is a newly built vessel named *The Pelican*. All Gulf tenders will be named after large birds.

The tenders are designed to provide living quarters for a 70-man crew, storage space for drill pipe, drilling mud, cement, fuel and fresh water. Ships are self propelled so that they can run from tropical storms if necessary. Under normal weather conditions, the tender may remain for extended periods on locations as far as 100 miles from the nearest source of supply.

A unique feature of the Gulf tender is the provision for helicopter service. On *The Eagle*, a heliport has been built on the ship's "fantail" behind the wheelhouse, radio and control rooms. The heliport measures approximately 50 by 70 feet. It will accommodate a helicopter with a rotor diameter of 55 feet and a gross weight of 6,835 pounds, the largest commercial ship now available. Such a helicopter would be capable of transporting eight passengers or 1,500 pounds of

cargo between the drillsite and shore base.

The Eagle has an overall length of 327 feet nine inches and breadth of 50 feet. Design speed is 10½ knots. Two 900 hp diesel engines are employed for propulsion. The vessel is equipped with radar, gyro compass and magnetic compass. Ship-to-shore marine telephone service is provided in addition to Gulf's own FM radio system. AM radio speakers furnish news and entertainment in all staterooms, and the ship's speaker can cut in when necessary. A radio direction finder is installed in the ship's room. Weather data is gathered by radio and ship-to-shore telephone from government sources and from A. H. Glenn's weather forecast.

The captain's quarters, radio and control room and the heliport are on the boat deck. On the main deck are staterooms, washrooms, galley mess room, recreation room, first aid room, mooring, loading and unloading facilities, cable tramway and platform for bridge from ship to drilling platform. Deck hatches are designed for handling drill pipe and other equipment.

On the second dock are locker rooms, laundry wash rooms, oxygen, acetylene and carbon dioxide supplies, machine shops, drilling supplies and dry storage for chemicals and cement.

The third deck carries active and reserve mud tanks, bulk mud and bulk cement bins. Pipe rack and machinery space occupies the center line in a compartment 30 to 240 feet extending to the main deck.

Liquid storage tanks, chain lockers, engine spaces and shaft alloys are in the inner bottom of the vessel. Drilling water tanks have a capacity of 11,692 barrels, wash water 1,780 barrels, and potable water 542 barrels. Only a limited reserve supply of potable water is necessary since the vessel is fitted with distilling equipment to produce 300 gallons per hour of fresh water. Ships bunkers provide space for 2,890 barrels of diesel fuel and 224 barrels of lubricating oil. Mud pit tanks hold 1,929 barrels and a caustic soda tank 100 barrels. Dry storage for bulk cement holds 2,372 sacks and for bulk mud 3,934 sacks. Waste oil and sludge is accumulated in a 135-barrel tank for periodic disposal.

Two 550-bbl. active mud pits, one on each side of the ship, are the usual source of supply for mud. A warning device with outside controls detects any gas in compartment atmosphere, registering it on a meter.

Four 250-bbl. reserve pits will be used in case the supply from the active pits must be increased, when the pits are being cleaned or when the active pit mud is not up to specifications because of dilution or contamination.

Pumps include two GXR 750 hp Gardner-Denvers, with capacity of 900 gallons per minute, and one GXC 550 hp, 900 gpm unit for mixing and transfer. Two 800 hp and one 640 hp Fairbanks-Morse diesels operate the mud pumps.

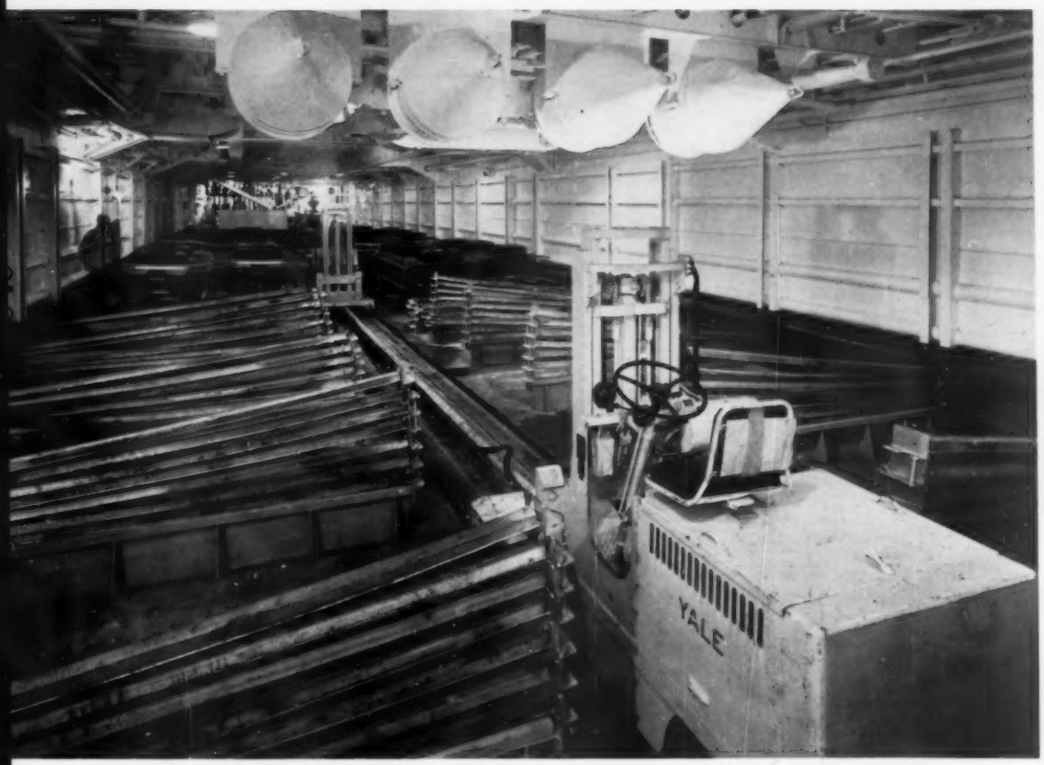
Bulk mud material is loaded aboard in 5,000-pound containers which are filled on shore. Barites are discharged from each unit into a jet mixing hopper and carried by liquid mud to an active mud pit, then blended into the mud in circulation. To maintain barites in suspension, electric stirrers are installed in active mud pits.

Liquid caustic soda is pumped to chemical mixing containers from which it is added to drilling mud. This is a new method of adding caustic, since on land soda normally is used in flake form. Liquid caustic soda to be used in mud is a 50 percent solution of NaOH in water, having a freezing point of 50°F.

Cementing equipment for *The Eagle* was leased from the Halliburton Oil Well Cementing Co. Machinery consists of a dual T10-AC skid-mounted unit with Howco pumps powered with General Motors diesels. Cement is drawn from three 1,000-sack bins.

Pipe racks are in the ship's regular storage area, where vehicles were stored for combat operations when the vessel was used as an LST. Bow doors have been sealed. Pipes are hoisted and stored by means of two KSI, AT-60 Yale Towne "Lift King" electric fork lift trucks with

Tramway system for transfer of pipe from the ship's hold to the drilling platform. Pipe will be hoisted from the hold by hydraulic lifts, picked up by the carriages running on the tramway cables, to be conveyed through the structure at the bow of the ship. It will be picked up at this point by the drilling rig drawworks.



Pipe storage racks on the third deck. Each layer of racks is firmly locked into storage position to eliminate possible displacement due to the rolling of the ship in heavy seas. The lift trucks pictured, which work in tandem, hoist the pipe through the deck hatches where it is secured to tramway carriages for conveyance to the drilling platform.

maximum fork height of 130 inches, 6,000-pound capacity at 24-inch centers. Trucks are electrically interconnected for operation of both forks simultaneously from either truck.

When lifted from the hold, pipe is slung from carriages on a tramway by load lines which prevent side sway and rotation. In heavy seas, a variable tension tag line, winch controlled, may be attached to prevent fore and aft swinging. The tramway carries the pipe to the bow of the ship, where there is a bridge to the platform. The bridge is suspended from a platform at the bow and connected to the drilling platform by a swivel which permits swinging up, down and sideways with the movement of the ship, but prevents rotation. At the ship end the inverted socket on the underside of the bridge rests on a ball which is free to roll in a fore and aft track. This arrangement allows the bridge to be flexible with the ship's movement, but will prevent overturning or binding. Pipe is taken from the tramway and slung into drilling platform position by derrick draw works.

Pipe storage in the hold is sufficient to drill a 12,000-foot well. The usual inventory is:

Feet	Diameter
500	20-inch
2,500	13⅜-inch
9,500	9⅝-inch
11,000	5½-inch
11,000	2⅜-inch
12,000	5-inch drill pipe

Two welded steel kingposts are the rear supports for the tramway cables used in handling pipe. They also are fitted with 45-foot, 11-inch booms of 10-ton capacity. Booms stow in horizontal position on a crutch which also serves as a pipe stop.

Two 2½-inch wire rope cables with a rated breaking strength of 670,000 pounds extend from the kingposts to the bow cable tower. On each cable, a two-wheel carriage runs from kingpost to bow cable tower. Tramway normally operates with the two leads burtoned together, but may operate on either cable alone. Carriages work off the same drum for synchronized movement, but each has a separate lift winch. Capacity is 10-ton maximum, three-ton normal.

Normally the ship is anchored to head into prevailing winds. It can be turned by use of anchor chains to head into the wind and waves. One of the four stern chains is the stream anchor with a 10,000-pound Danforth anchor. Seven other chains are tied to spud piling driven into the ocean floor about 1,000 feet from the ship. Provision has been made for instantaneous severance of mooring chains to free the ship for an emergency departure. Mud lines also can be quickly disconnected.

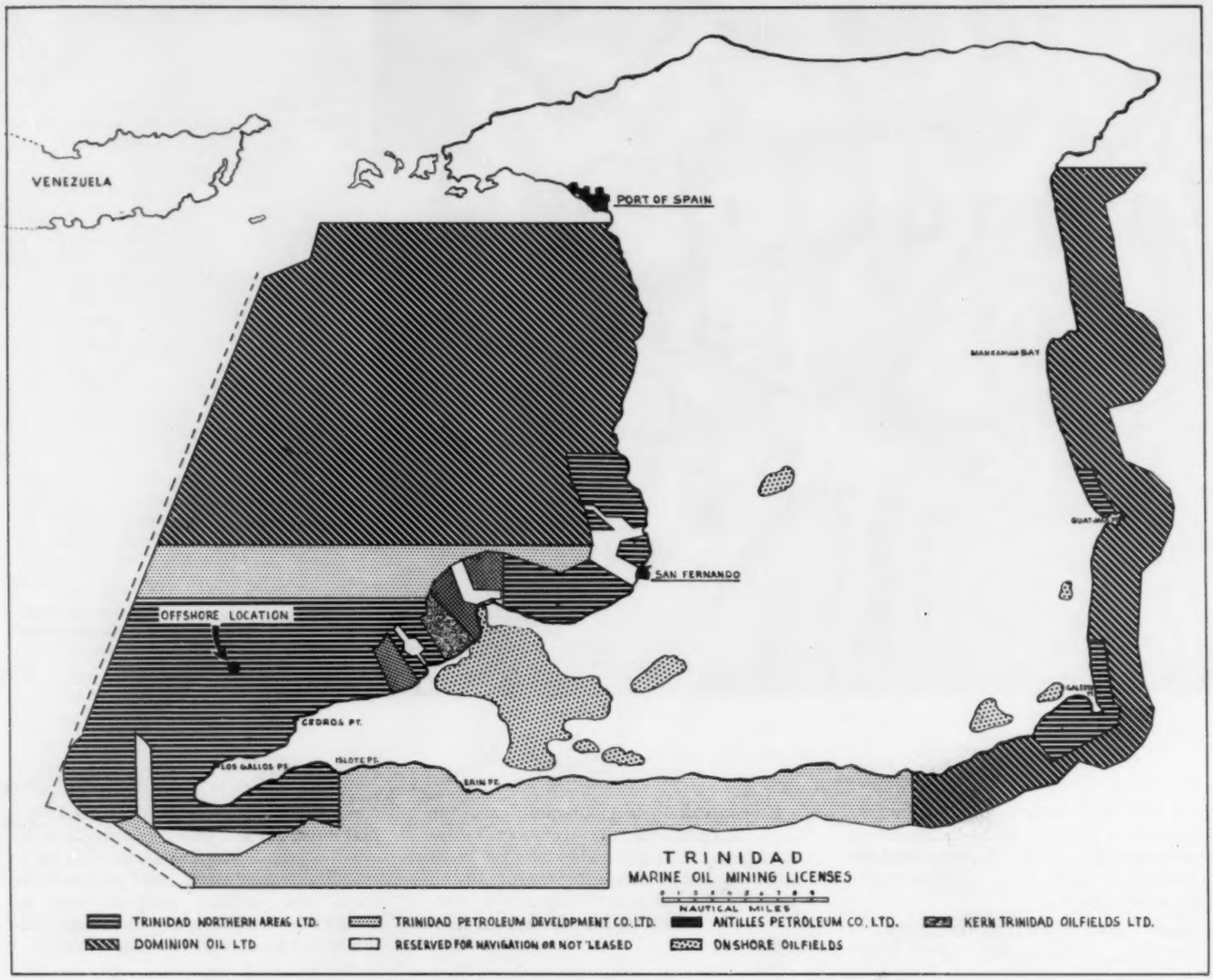
Fire protection equipment in *The Eagle* includes a carbon dioxide system for blanketing the main engine room, paint locker, galley, boiler room and the main cargo and machinery holds. This and a high pressure salt water system throughout the boat is supplemented with portable fire extinguishers, sand pails and fire axes. The drilling platform can be covered with water spray from four flexible water nozzles on the ship's bow.

The vessel is equipped with two 90-man lifeboats, one to each side of the boat deck. The lifeboats are 10-man hand-propelled.

On the drilling platform itself three ram-type blowout preventers and one bag-type preventer have been installed.

Since the drilling crew will be on location for a week and the ship's crew 10 days at a time, Gulf has gone to considerable pains to provide comfortable quarters and recreation facilities. *The Eagle* is completely air conditioned. Separate exhaust systems for various areas are provided. The mess room is pressurized to prevent cooking odors from being noticeable. Ventilation is mechanically forced. The recreation room below the heliport is equipped with a TV receiver, a motion picture projector, AM radio, card tables, books and magazines.

Penrod Drilling Co. now is in charge of Gulf's current wildcat test. The drilling crew works a 12-hour tour and is on location seven days and on shore seven days. Overtime pay due to the arrangement of tours is such that the crew will earn more money offshore than on usual land operations.



Offshore drilling begins in Gulf of Paria

THE FIRST WELL to be sunk in the high seas in the British West Indies was spudded July 4 by Trinidad Northern Areas Ltd. in the Gulf of Paria between Trinidad and Venezuela. The test is drilling from a platform built in 40 feet of water. Location is six miles northwest of Cedros Point.

Heretofore the only marine operations in Trinidad have been directional wells drilled from the shore by Antilles Petroleum Co. (Trinidad) Ltd. Recently more than half of that company's production has been from wells bottomed under the Gulf. Antilles' operations have been on two tracts totaling about 12,500 acres between high water and the three-mile limit off the southwest coast. Production is off Point Ligoure not far from Point Fortin.

Earliest marine exploration licenses in Trinidad under the 1945 regulations were within the three-mile limit. In February 1952, a marine license covering 346,000 acres of high seas was granted to Dominion Oil Ltd. of Canada, a subsidiary of Standard Oil Co. of California. Granting of this license stimulated activity on the part of other companies so that by January 1953, licenses had been taken on all territorial waters from the south side of Port-of-Spain harbor around the entire east, south and west coasts up to the northern end of Matura Bay. Licenses also were granted over all submarine areas of the Gulf of Paria outside the three-mile limit, but within the jurisdiction of the colony. Only exceptions are a few areas reserved for navigation and an area of 6,600 acres where the water depth is greater than 20 fathoms. Total area under license as indicated on the accompanying map was 896,890 acres on January 1, 1953.

Development of new reserves in offshore locations is particularly desired by Trinidad oil companies because of their inability to increase production of the colony through discovery of new onshore fields.

Only by persistent drilling has it been possible to keep output steady at sixty-odd thousand barrels daily. Trinidad's

annual crude production for the past 10 years has been as follows:

	Thousands of Barrels
1953	22,346
1952	21,258
1951	20,843
1950	20,632
1949	20,617
1948	20,107
1947	20,433
1946	20,142
1945	21,000
1944	21,543

In an address at ceremonies attending the beginning of drilling on the new offshore test, J. B. Christian, chairman of Trinidad Northern, said that the venture comes at a critical time. He pointed out that the ratio of crude production to reserves is unsatisfactory so that a probable decline in production is an early prospect unless new discoveries are made.

A difficulty in Trinidad is that the government does not encourage exploration through the device of a tax allowance for depletion of reserves as is done in Canada and the United States. Mr. Christian stressed the international character of the petroleum industry and, in connection with depletion, said: "At the start of the race for markets, the Trinidad companies are back markers."

Mr. Christian recounted the efforts that Trinidad Northern has made to find oil in the colony since 1936.

"We have carried out geological surveys from the foot of the Northern Range to the Naparima/Mayaro road, gravimetric surveys have covered the whole island, and seismic surveys were concentrated in the area between Caroni, Sangre Grande and the Central Range," he said. "The drilling rig has visited Talparo, Montserrat, Barrancones and Harmony Hall, and more recently Mount Harris and Charuma. However, the joint efforts of the companies that go to make up Trinidad Northern Areas, namely, the Anglo-Iranian Oil Co., Trinidad Leaseholds Ltd., and the United British Oilfields of Trinidad, which have cost $8 million, have unfortunately resulted only in the collection of a large volume of geological information and no oil.

"After such a long history of failure, it has taken considerable courage for my board to embark on this formidable new project which itself represents the culmination of efforts which began nearly 20 years ago, since which time a host of technical reports have been prepared and a multitude of profitability studies made."

The Trinidad Northern installation is a 50 by 110-foot platform erected by the templet method. It is supported 17 feet above sea level by eight 24-inch piles driven through the jacket to a depth of 90 feet below the bed of the sea. Derrick substructure is 29 feet above sea-level and the crown block 165 above the sea.

Total gross weight resting on the piles is 952 tons. Steelwork in the jacket weighs 60 tons, the platform 147 tons, the piles 104 tons and the tubulars 361 tons. Equipment on the platform weighs 380 tons.

Trinidad Northern drilling platform in Gulf of Paria.

Construction of the equipment required the services of 91 men including launch crews and shore services. Work on a road to the shore was begun in March 1953, and jetty construction undertaken in June. Pontoons were received in January of this year and the jacket towed out to location on May 4, 60 days before drilling began.

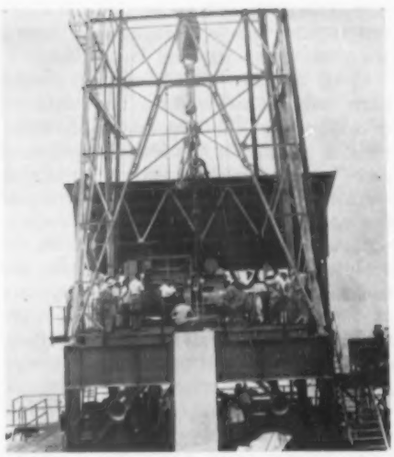
The 129-foot derrick erected for the well has a 24-foot base. Load capacity is 925,000 pounds. Drawworks is an Ideal type 50 with a nominal capacity of 6,300 feet of 3½-inch drill pipe. Two 300 hp Paxman 12 rph engines drive the drawworks. Two Ideal C-350 mud pumps are driven by 400 hp Paxman engines.

The platform has storage capacity for 17,000 cubic feet of mud, 1,000 sacks of barites and 200 sacks of chemicals. Mixing equipment consists of a Gardner-Denver 5 x 10-inch pump driven by a Caterpillar diesel, two 7½ hp paddle mixers and a 40 hp Merco concentrator. Total installed horsepower on the platform is 1,795 and 75 kw of electricity is available.

Cost of the platform and facilities has been about BWI $1,200,000. Barge facilities for carrying equipment to the site were an additional $370,000. All told, the cost has been about twice as great as that required to prepare for drilling an onshore well.

Survey work looking toward drilling of the present well was begun nine years ago in 1945. The government license was granted July 1, 1946 and gravimetric survey work started the following year. Test drilling was done in 1950. Seismic reconnaissance and sedimentation surveys were carried out in 1952 and 1953.

Preliminary planning and preparation for this wildcat has been in progress nearly a decade, and $3 million was spent before a single foot of hole was drilled.



Oil company and Government officials inspecting drilling machinery.

Left to right: F. R. Pacey, administrative manager, Trinidad Northern Areas Ltd.; Maurice Dorman, acting governor of Trinidad; G. G. Braithwaite, United British Oilfields Ltd.; and J. B. Christian chairman of Trinidad Northern and general manager of Trinidad Leaseholds.

F.P.C. chairman suggests.

Canadian gas may still be needed

By Joseph Huttlinger

THE PACIFIC NORTHWEST Pipe Line Corp., Houston, Texas, hopes to begin construction this autumn on a $190 million natural gas pipe line system from the San Juan Basin of New Mexico and Colorado to the Pacific Northwest, including the cities of Seattle and Portland.

C. R. Williams, president of the company which received a certificate of necessity from the Federal Power Commission on June 18 in a bitterly-contested case, issued this statement:

"We will proceed with construction of the system as soon as possible. While it will take two construction seasons to complete the job, we hope to deliver gas to local distributing companies by late 1955. Construction will be done with multiple crews and all northwest portions of the main line will be completed at approximately the same time."

The other company contending for a certificate to serve gas to the area, Westcoast Transmission Co. Ltd., Calgary, Canada, has asked the FPC to restudy the matter in an appeal filed within the 30-day limit from the decision day. What the commission will do with this appeal is to be seen, but presumably announcement will be made before the deadline date for commission action — that is, on or before August 18. If this is denied, Westcoast could, and probably will, take the matter to the United States Court of Appeals, most likely to the Third Circuit Court sitting in Philadelphia.

The final outcome of the case thus depends upon further steps by the commission and possibly by the courts. Consequently there may be a question whether the project will get under way as quickly as its promoters claim. Persons familiar with the battle over the transmission of gas from the Southwest to New England recall that court procedures held up action for some time. While the issues in the present case are somewhat different, attorneys for both sides are alert to the prospect of delay.

A condition attached to the certification granted to Pacific Northwest by the Federal Power Commission was a requirement that the company complete its financing promptly and begin construction by January 1, 1955. While officials of Pacific Northwest anticipate no difficulty in arranging their financing, court action might delay it and possibly pave the way to a compromise.

Among members of the oil and gas industry who have no ties with either claimant, opinion on the Commission's decision is divided. On the one hand, it is asserted that if the demand for natural gas continues to grow at its present phenomenal rate, the national interest will be served by obtaining some part of its supply from outside sources and that Canada, with a vast gas potential far beyond its own requirements, is the logical place to get it. Others decry the possibility that domestic supplies in the United States will ever run short. Their argument is, in any case, "While we have the supply let's use it."

In Canada there has been general disappointment in oil circles over the decision of the FPC in view of the dominion's liberal attitude in the past in admitting oil and oil products from the United States and because the denial of an outlet for its surplus gas will operate to slow down exploration and drilling in certain areas.

There is a feeling also that Canada's case was prejudiced by the fact that consideration in the final discussions was confined to a single company in a single area. This feeling was expressed by the Minister of Trade and Commerce C. D. Howe, who said in Ottawa: "I thought for a long time they were taking rather a long shot in attempting to serve that market from the Peace River area. I felt that the other applications who proposed to take gas from southern Alberta should have received more consideration than they were given in this House . . . I felt they would have had a much better chance of entering the market than from northern Alberta."

A similar thought was expressed by Chairman Jerome K. Kuykendall, chairman of the FPC, who agreed with the other four members of the commission in their decision to give Pacific Northwest a certificate, but had this to say:

"This leaves Westcoast's application standing alone as opposed to Pacific's and I concur with my associates that in this posture the national interest is better served by the granting of a certificate to Pacific. However, the record before us, including maps of the various projects which have been proposed, indicates to me, although I do not prejudge the question, that the entire Pacific northwest area could be better and more cheaply served by natural gas transported from southern Alberta.

The information we have also indicates, although again I do not prejudge the fact, that the Peace River gas field of northern Alberta and British Columbia might be connected with those of southern Alberta more cheaply than a parallel line could be constructed from the Peace River area southerly along the coast of British Columbia, as proposed by Westcoast.

In view of this situation, I am reluctant to take final action at this time which would preclude the possibility of what probably is the soundest project which could be devised to provide natural gas to the Pacific northwest area.

"Because of the necessity of preventing further protracted delay in providing natural gas to this region, I would not refuse a certificate to all parties in the vague hope that a better project may materialize.

"However, I would not grant a certificate to Pacific at this time, but would enter an order granting such certificate within a stated time from this date, unless within such period the Canadian and appropriate Provincial governments authorized the export of an adequate supply of gas from southern Alberta to this country by a company of their own choice, and within such time there was filed with this Commission an application in proper form for a certificate to construct the facilities necessary to deliver such gas from the southern Alberta border to the Pacific northwest."

The Kuykendall opinion is regarded as a supplementary view to that of the other four commissioners, whose opinion is the formal one of the commission. This formal opinion found that Pacific Northwest has "adequate gas supply," that the route of the proposed line would cross "at least three undeveloped sedimentary basins in the states of Colorado, Utah and Wyoming," and that the company would serve more persons than would Westcoast. The Pacific project was held "economically

(Continued on page 55)

Western Canada stunned by decision

EDMONTON, ALBERTA

TO SAY THAT Western Canada was surprised by the decision of the Federal Power Commission in Washington denying the entry of Canadian natural gas into the United States and approving instead the application for a more costly line from southern Colorado and New Mexico to serve its Pacific northwestern region would be a gross understatement. "Astounded" would be a better descriptive. After following the evidence given before the FPC over the past two years, it seemed to be almost a foregone conclusion that the permit would be awarded to the Westcoast Transmission Co.

No less astonishing than the decision itself was the reason for it advanced by the commission of uncertainty as to the adequacy of the Canadian supply.

Some three or four years ago, Dr. Dodge, representing one of the applicant companies at an earlier hearing before the Conservation Board in Calgary, stated in evidence that Alberta possessed so much surplus gas that in time it would be "running out of Western Canada's ears." Later on, in the years that followed, one heard the same phrase from oil and gas men in Calgary. It was originally said so long ago that Dr. Dodge no longer gets credit for the actual words. In an address before the 28th annual meeting of the Natural Gas and Petroleum Association of Canada at Windsor, Ont., given in the early part of June, Dr. G. S. Hume, director-general of scientific services for the federal department of mines and technical surveys, without quoting Dr. Dodge's words, said, nevertheless, that Alberta has so much natural gas that the finding of markets, rather than the location of new supplies, was likely to become the major problem once the Trans-Canada gas pipe line was completed.

Just recently Dr. Govier, member of Alberta's Petroleum and Natural Gas Conservation Board, was reported by the press as having stated in a public address that, with increases in Alberta's gas reserves constantly appearing, it was only a matter of time when a total of 40 or 45 trillion cubic feet would be established.

It appears now that the prediction of Dr. Dodge is coming close to realization and that, unless exploratory drilling is slowed down, Western Canada will have gas "flowing out of its ears."

Federal Minister of Trade and Commerce C. D. Howe said, following the announcement of the FPC award, that the policy for the sale of Canadian gas was made in the west and not in Ottawa and he added, "I think we might do a little better." He expressed regret that the applications of other companies proposing the transport of gas from southern Alberta to the northwestern United States had not received consideration. Referring to the project of a transcontinental gas line across Canada, he pointed out that the government has had to wait two years after the first application was granted before it could get permission to bring gas to Eastern Canada. "We obtained that during the past two or three months," he said, "and that is a project with which I think the government can give some assistance. But projects that are started by others, controlled by others and for which permits are given by others, are very difficult to get a toehold on where it could be really useful."

The opinion expressed by Mr. Howe seems to be in agreement with that of Chairman Kuykendall of the FPC, who stated in a supplementary opinion at the time of the decision that he felt that more consideration should be given to the availability of gas from southern Alberta. Ray Fish, head of the Pacific Northwest project, also has suggested the possibility of obtaining future supplies from southern Alberta. Would such a plan now be endorsed by the Alberta government? The local feeling seems to be that it would not.

A recapitulation of Western Canada's gas development covering the past two years is now interesting. Early in 1952 the Alberta Conservation Board's report declared that surplus gas in Alberta at that time existed only in the Peace River area. Westcoast Transmission was therefore granted the permit for its line to the Pacific Coast and all other permits were rejected.

At the time when President McMahon, head of Westcoast, received the permit, he had only 300 billion cubic feet in reserves in the Peace River area. Within a year, however, Mr. McMahon and his associate companies established a total of 2.5 trillion cubic feet, sufficient for the 20-year period. That total has been considerably increased by now.

Among the rejected applications at that time was the Northwest Natural Gas Co. project headed by Faison Dixon of New York. The proposal was to build a line from Pincher Creek to the Pacific Coast which would service Vancouver and other British Columbia points together with centers in the northwestern United States. Distance of the line was shorter than that of the northern route, and engineering problems were of little consequence. Because of these factors it was claimed that a Vancouver city gate price on Alberta gas would be around six cents per mcf, less than that of any other route. Prices to United States points would also be reduced. On the grounds, presumably, that no surplus gas existed in southern Alberta at that time, the application was rejected.

This was the situation two years ago. Beyond further successful gas development in the Peace River area, nothing further has happened until just recently when the FPC at Washington rejected the Westcoast application.

Trans-Canada Pipelines Ltd., having received its permit from Alberta for export of gas to eastern Canada, is now before the Board of Transport Commissioners at Ottawa for endorsement of the project. Justice J. D. Kearney, the chief commissioner, so far has stated that the board is going to examine all aspects of this great undertaking, including financing and marketability of gas. Rather than grant an immediate outright authorization of the complete line, the permit would be granted by stages.

The question of economics surrounding this great issue appears at long last to be receiving a closer examination than heretofore, and political considerations seem now to be of less importance. It is hard to understand how the latter can influence very much the operation of an undertaking of such magnitude. The length of a line, its engineering problems and the number of markets en route are all factors having an important bearing on the producers at the beginning of the line receiving an economic price and on consumers en route and at the end, a price which would be competitive.

New Lockheed fighter plane able to take off and land vertically is powered by twin jet turbines harnessed to contra-rotating propellers. The XFV-1 can (1) take off vertically from a standing start on its tail, (2) level off to fly and fight at very high speeds, (3) hover stationary in the air and descend for a pinpoint landing by backing straight down.

Fuels for the *JET AGE*

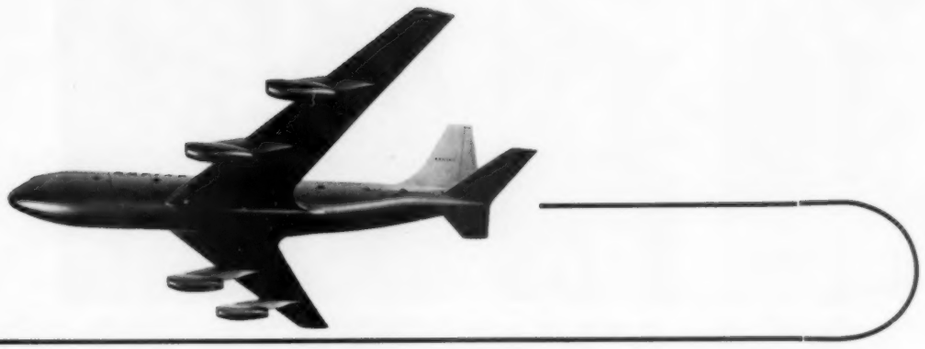
THIS WAS THE YEAR, most competent observers were saying only four years ago, that was to mark the beginning of the jet age on the commercial air routes of the United States. These same experts are now predicting that the epoch of the jet will begin in 1960 and 1965. Meanwhile the airlines of this country and several foreign carriers are rushing to the West Coast to place orders for advanced versions of already well known piston engine transports.

Just what has happened to the jet age which dawned with such promise at the end of the last war? It is here and it is not here, and the confusion is great and the consternation even greater. One fact is certain: the air forces of the great powers are bristling with jets, and advanced jet fighters have been proved in combat in Korea. For the military, the next step, that of the intercontinental guided missile with the atomic war head, is in sight and the delta wing bombers may be obsolete before they enter battle.

From the commercial point of view, the British have shown the way, their jet transports having been flying the airways since 1952. Now, because of a series of unexplained accidents, the world's first jet liners, the deHavilland Comets, are all grounded and the airlines that were using them are trying to fill the gap with anything they can lay their hands on. Meanwhile, designers and engineers on both sides of the Atlantic are searching for clues that will lead to an explanation of the apparent disintegration in flight of these proud new aircraft. Even when the cause is found, there is the possibility it may be some years before the public will have confidence in their airworthiness and it is doubtful that their operators will find it an easy task to get Comet I's airworthiness certificates from the United States government. Thus, commercial aviation finds itself at a crossroads, unable to proceed and in some instances forced to turn back.

From the point of view of the oil industry, it is important to assess the present status of air transportation and to determine with some degree of accuracy the types of fuels and the lubricants that will be required by commercial aviation within the next few years. Volume wise, the sales to commercial aviation are small in comparison with the market for motor gasoline, solvents, distillates, etc., but the complexity of the manufacture and distribution of aviation fuels, and the capital tied up in facilities, require the refiner to plan well ahead. It is the purpose of this article to examine the equipment status of the commercial airlines and to estimate, insofar as is possible, the petroleum requirements of these carriers within the next few years. Some indication is also given as to the requirements of the military.

In the field of commercial aviation we are faced with the fact that most of the airliners of the world are using post war, American built, reciprocating engine transports. Under normal circumstances these aircraft would carry the major part of the world's air traffic for the next ten years, but the British, with their experience in building a jet powered transport, threaten to make the American post war transports obsolete. In fact, one American carrier, Pan American World Airways, which flies routes paralleling those of British Overseas Airways and other foreign flag carriers that have until recently had the jet-powered Comet in service, has placed an order for three advanced type Comet III's for delivery in 1956. This is the first time in more



Scale model of the new Boeing jet transport-tanker prototype.

than a quarter of a century that an American carrier has placed an order abroad for aircraft. Could this mean that between 1956 and 1960 the majority of the world's airlines will have switched to turbine powered aircraft? And if so, will these aircraft be of British or American design?

Much has been said on this subject, and it becomes increasingly difficult to evaluate the true picture of the status of the jet transport with claims and counter-claims from both sides of the Atlantic. The British, with jet transport experience already under their belt, claim (with some validity) that the jet age is here. American airlines are flying "paper jets" from coast to coast every day, and the aircraft manufacturers on the West Coast have designs that they would put into production if they could find a buyer. Both the American airlines and the manufacturers take the position, however, that the jet transport and particularly the jet engine have not yet been developed to the stage where they can be operated at a profit. Experience is of course being obtained every day in military service with jet bombers and fighters. The lessons learned from these military operations are being incorporated in designs still on the drawing boards. On this basis, American manufacturers apparently feel that by the late 1950's, when the more advanced British transports like the Comet III and Vickers VC-7 are ready to go into service, they will be able to jump into production with high capacity, long range jet transports that will meet all competition.

One American manufacturer is making sure that it will have something to offer the commercial airlines when they get ready to place cash on the line for jets. This is Boeing, the designer and builder of the medium and heavy jet bombers,

Vickers Viscount turbo-prop plane of the type which will be put in service by Capital Airlines on domestic routes in the United States. Capital has ordered three planes and optioned 37 more. British European Airways now is using the plane commercially and it is to be put into service in Canada within a year.

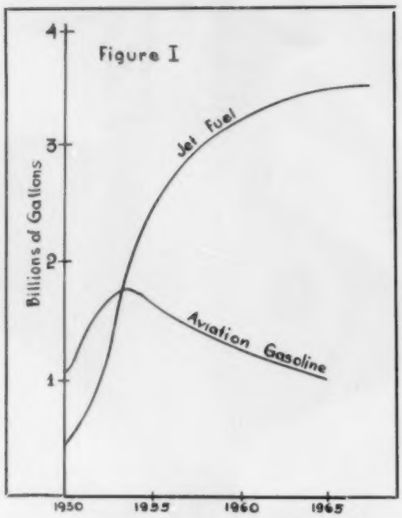


Fig. 1. Estimated demand for aviation fuels by Military Services.

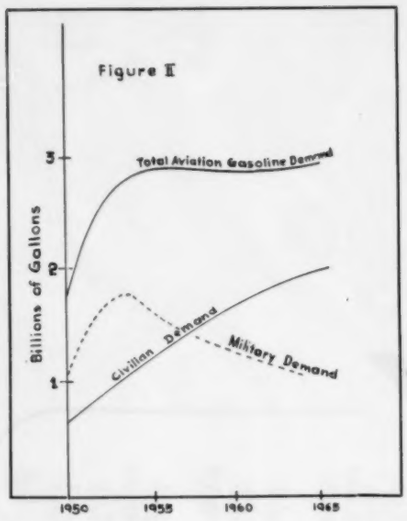


Fig. 2. Estimated demand for aviation gasoline.

Wright Aeronautical's Turbo Compound engine that powers the Super-Constellation and Douglas DC-7. Using grade 115/145 fuel, this engine develops 3,250 hp at takeoff. Upper right is power recovery turbine, one of three on this engine.

the B-47 and B-52. Boeing is risking $15 million or more of its own funds on a jet powered transport, the Model 707, which started taxi trials this spring at Boeing's Renton plant in the state of Washington. These trials were brought to an abrupt halt by the collapse of the landing gear during high speed breaking tests and from the appearances of the damage, it would appear that in addition to extensive repairs there will be some redesign necessary. As a result, it can be expected that the trials will be delayed. No other American manufacturer, so far as is known, has started to cut metal for a jet transport. Boeing, it is true, is reducing its chances of losing its investment by designing the 707 so that it can be a refueling tanker for the military. Mid-air refuelling of jet from jet has many advantages that will undoubtedly justify the military services in eventually picking up the check for Boeing's work on the Model 707.

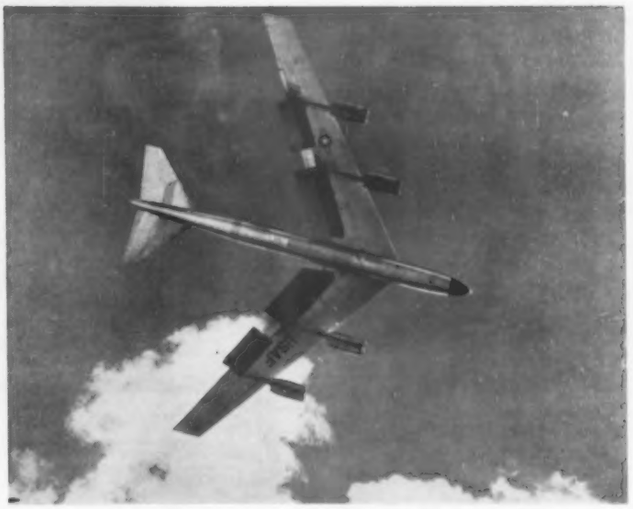
In addition to the jet transport, there is another type of turbine-powered airplane that is definitely to have a role in commercial aviation. This is the turbo-prop transport, twin-engine versions of which are already in service on the routes of British European Airways. Here again Britain is in the lead, for although Allison and Pratt & Whitney in the United States have turbo-prop engines that are being used by the military, no airplane manufacturer has built a commercial transport around them. The British, in addition to having turbo-prop transports in service, have large ones undergoing flight trials and these, the Britannias, may go into trans-Atlantic service in 1957. Somewhat slower than the turbo-jet, the turbo-prop has a greater range and is more economical to operate than the pure jet. Initial cost of both types is about the same, but the turbo-prop, because of the necessary reduction gears, is more complex and has not yet reached the degree of development of the jet. Its future lies in the cargo transport and in the tourist-passenger transport; it will also be found in the short-to-medium range transports like the Viscount now being used by British European Airways and scheduled to go in commercial service in Canada within a year. Some airline operators feel the turbo-prop will eventually displace the pure jet in civil transports because the speed of the jet is limited on account of passenger comfort to speeds below 600 miles an hour while the turbo-prop is already in the 500 mile an hour class.

At the present time, better than 90 percent of the civil transports in service throughout the world are American made and are of the reciprocating engine type. Many of these are of the latest type and will be in service for at least ten years on the major routes. Of the 20-odd Comets built to date, only 14 are still in flying condition, and in view of the unfortunate series of accidents they have been through, their future is open to question. The British Britannia turbo-prop has also run into trouble in its flight trials and its introduction to the airways will undoubtedly be delayed.

After such a brilliant start, it is most unfortunate that the British, who have done much to pioneer the turbine-type transport, have met with so much serious trouble. America has been slow to develop the jet engine and in many cases has had to license designs from the British; interest in commercial application of jet power in the United States has been mostly academic because the state of development of the jet engine does not permit it to be operated profitably in commercial service. Yet, where the superior performance of the jet has been needed, that is for military purposes, the United States is well out in front. And there is little doubt that as soon as a transport can be designed that can operate at a profit, the United States will build it and sell it. In the meantime, some airlines, including Pan American, may have to go through with plans to buy British jets in order to compete with the jet services of the government controlled British Overseas Airways. Within the United States, the use of jet aircraft is not expected on commercial routes until 1960 at the earliest. Current thinking in the industry that any commercial jet transport should be used for a year or more in cargo service to give it a thorough shakedown could delay jet operations in the United States until 1965. The introduction of the turbo-prop could be much sooner, particularly since its certification by the United States government for use on the civil airways is almost routine because it uses the conventional propeller to obtain thrust. As a matter of fact, a non-scheduled operator, Trans Caribbean Airlines, was discussing the possible purchase of two Viscounts with Vickers in April, and it is reported that Capital Airlines, a certificated carrier, is considering buying as many as 50.

What about fuel requirements of the turbine powered airplane? Up to now they have been relatively simple — kerosine for the commercial operators and a wide range fuel meeting the American specification MIL-F-5624B and British D. Eng. R.D. 2486. For the good of all concerned, it is to be hoped the diversification of jet fuel can be confined to these two grades because the manufacture, transporting and storing of five or six

Shown taking off on its first test flight is America's first twin-engine turbo prop military transport, the Convair YC-131C. The YC-131C is a Convair-Liner 340 converted to turbo-prop power. The two Allison YT-56 turboprop engines develop 3,750 hp each.



The Boeing B-52, America's intercontinental jet bomber using eight Pratt and Whitney J57 turbine engines. Production is just beginning on this aircraft.

grades, as is the case today with aviation gasoline, would make the cost of jet fuel to the operators unnecessarily high.

Unfortunately the trend toward more critical jet engines, particularly those of higher pressure ratios, is creating a feeling in the minds of some engine manufacturers for specially refined grades of jet fuels. Then there is the school of thought that is advocating engines that will burn gas oils or light diesel fuels.

From a cost standpoint, these fuels look attractive and the aircraft and engine manufacturers, as well as some operators, are investigating their application. The freezing point of the distillates is of course higher, which makes them unsuitable for military purposes and puts limitations on their utilization by commercial operators. They have a higher heat of combustion per unit of volume than the lighter fuels, a fact which is in their favor if the space for carrying fuel is limited. However, an engine burns fuel by the pound, and on the basis of Btu's per pound, they are not as attractive as kerosine.

The trend in aircraft design, particularly the trend toward the thinner wing, has tended to make modern aircraft volume limited and on this basis the heavier fuels are the more attractive. Adoption of external fuel tanks, however, could result in the aircraft being weight limited and in this case kerosine or gasoline type fuels would, other things being equal, be preferable.

These are the questions that are facing the designers, engineers, and economists who are wrestling with the problem of the integration of the jet transport into the existing airline structure. For the immediate future, however, the airlines using jets and turbo-props will buy kerosine type fuels. Military operations will be conducted with the wide-range fuel meeting the U. S. specification MIL-F-5624B.

The manufacture and sale of jet fuel to the armed services has become big business. This year, for the first time, these sales, estimated at 2.3 billion gallons, will exceed the military's purchases of piston engine fuel, estimated at 1.6 billion gallons. Some idea of the expenditures of the armed services for aviation fuels was given in recent testimony before the House Military Appropriations Subcommittee in which it was stated that the fuel bill for aircraft during fiscal 1955 would be approximately $750 million. The Air Force gave the following breakdown of its anticipated purchases:

Jet Fuel	$305,376,000
Grade 115/145	148,751,000
Grade 100/130	84,099,000
Grade 91/96	10,577,000
Grade 80	170,000
Total	$548,973,000

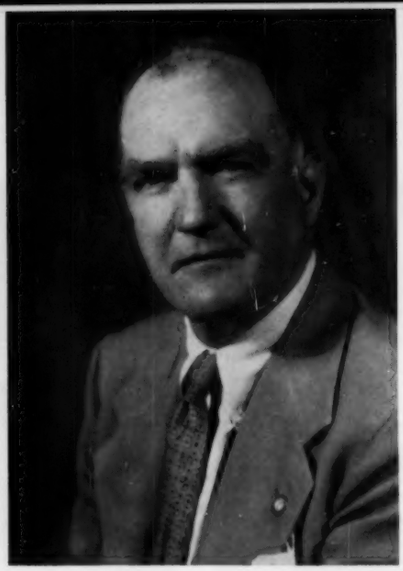
Future requirements of the military for fuels are extremely difficult, if not impossible, to estimate because of the uncertainties inherent in the international situation. If it is assumed that the Air Force will have a strength of 120 wings and if its duties are maintained at the present level on a global basis, including emergency air lifts and support of United Nations forces at trouble spots, jet fuel demand can expect to increase to 3.5 billion gallons a year in 1965; aviation gasoline demand by the services will have decreased to 1.2 billion gallons by that date. The demand for both types of fuel by the military, on the basis of the above assumptions, is shown in Figure 1.

Civil aviation is expected to continue to grow during the next decade. New equipment will permit the growth of tourist class service, which in 1954 was made available for the first time to passengers wishing to circumnavigate the globe. Cost of this trip is $1,348, while the tourist fare across the United States is $99. Tourist services will stimulate the growth of medium and long haul traffic. Short range and inter-city air traffic will begin to compete more effectively with surface transportation as the helicopter is introduced into this type of service.

The use of aircraft by business, becoming more essential every day, will continue to grow as aircraft are developed for this purpose. The convertiplane, a cross between the helicopter and conventional airplane being fostered by the military, could be an indispensable corporation aircraft. It could utilize with safety the restricted landing areas that are close to many industrial plants. The only type of flying not likely to increase at an accelerated rate is private flying. The high initial cost, plus maintenance, and the complications of ground transport to and from the airport and the increasing congestion at the larger airports are all factors that work to the disadvantage of the private flyer.

Today the civilian demand for aviation gasoline amounts to a little over a billion gallons a year. By 1960, this will have increased to about 1.5 billion gallons, and by 1965 we can expect civil aviation to take 1.7 billion gallons a year. Figure II shows the estimated civilian demand in the United States through 1965 and the overall demand, both military and civilian, which will reach its peak toward the end of 1954 and remain more or less at just below three billion gallons a year through 1965.

Alan McCone was an investment banker for a dozen years after his graduation in 1929 from Stanford University. In 1941 he joined Sun Oil Company at its Marcus Hook refinery as a boilermaker's helper. The story of why he foresook banking for boilermaking was published in The American Magazine and later reprinted in The Reader's Digest in 1942. At Sun Oil Mr. McCone



was successively a first-class boilermaker, shift superintendent in a mechanical department, labor recruiter and assistant coordinator of labor relations at Marcus Hook. He joined Catalytic Construction Co. as manager of industrial relations when the company was formed in 1946. He has since handled field labor relations, safety, personnel, security, public relations.

Problems of employee merit rating

By Alan McCone*

WE HAVE RECENTLY completed an employee merit rating program using an extremely simple form which has produced very gratifying results. This rating has been of real value to the company not only in the ranking of employees in the various job classifications, but also in aiding supervisory development.

We feel that the steps taken to implement this program, as well as the results derived from it, will prove of interest to other companies which have a small personnel department and do not wish or cannot afford to set up the complex and demanding systems in use today in various large corporations.

Catalytic Construction Company, by reason of certain unusual situations, needed some type of system for evaluating employees. The system had to be simple enough to administer as a part-time function of the personnel department and make limited demands on the supervisory staff.

Catalytic's critical requirement for a means of employee evaluation arose from an increase in the payroll from 150 to more than 1,000 in three years, and the division of this staff among three completely segregated installations. Employees in like categories worked on different projects, in different buildings and under different supervisors. The new employees were principally engineers, designers, draftsmen and associated clerical personnel. Because production is difficult to measure in such groups, there was no established means of comparing individuals in the same job classification in different divisions.

*Manager of Industrial Relations, Catalytic Construction Co.

Company management had its biggest headache during the twice-yearly salary review. One supervisor might recommend salary increases for 20 percent of his staff while another's recommendations were for 80 percent. There was no reason to believe that the latter group had four times the number of employees who deserved increases, but there was no concrete means available to management of evaluating the various employees. Less frequent, but more critical, were decisions relating to promotions, re-assignments and terminations.

Sound evaluation of his subordinates is an important function of a supervisor's job. On such evaluation should depend every change in employee status including wage action, assignments, promotions and terminations. Since a man is a very complex blend of physical, intellectual and emotional characteristics, it is unreasonable to assume that anyone can judge another with absolute accuracy. The best that can be hoped for is a relative measure of the individual against some arbitrary standard.

Employee evaluation systems are a widely-used means of assisting supervisors in judging their personnel. In their simplest form, evaluation systems establish a group of standards or personal characteristics required to perform a job. The degree to which an individual possesses these attributes is the measure of his merit. There are basically two fundamental types of evaluation systems. One compares individuals with one another. The other type measures the individual against some accepted standard.

The rank order system requires the supervisor to place in order from best to poorest the employees in his department or separately for each of a number of traits or factors. The individual's average ranking in various factors would establish his overall rating in the group.

The chart system employs factors of the type that may be used in the rank order system, but establishes varying degrees to which these characteristics may be possessed. Each degree of each factor may be given a numerical value, and the sum of these is a score which permits the ranking of individuals in similar job classifications. The variations of these systems are almost as numerous as the companies that employ them.

As the art of evaluation has grown, the number of factors used on some forms on which the employee may be rated has grown to more than 100. The degree to which these factors may be demonstrated is often 10 or more. Since all factors are not of equal importance, each degree of each factor may be weighted for a finer grading. Finally, since no two raters think exactly alike, it is desirable to determine any rating characteristic among them and adjust their evaluation for comparison with those of other raters. These complex systems require careful and extensive administration — often a special technical staff. They also make heavy demands on the supervisors' time because of the numerous judgments that are required. Such systems are not practical for smaller organizations as they cannot afford the cost in specialized personnel or in supervisors' time.

In considering a type of merit rating that would suit our purposes, we rejected

Fig. 1—Merit rating sheet showing numerical values assigned to the eight factors by which an employee is judged. These numerical values do not appear on the forms as supplied to supervisors for semi-annual ratings.

Date 11-1-53

EMPLOYEE MERIT RATING REPORT
CATALYTIC CONSTRUCTION COMPANY
INDUSTRIAL RELATIONS DEPT.

NAME I. M. JONES — DATE EMPLOYED 8-6-50 — OFFICE OR DEPT. COMM. D. & D. — JOB TITLE DESIGNER (1)

	EXCELLENT	GOOD	AVERAGE	FAIR	POOR
QUANTITY OF WORK - The amount of work which the individual satisfactorily completes within a given period of time.	25	(20)	15	10	5
WORK KNOWLEDGE - The extent to which the individual understands the information which is required to perform his present job.	(16)	12	8	4	2
ACCURACY - The degree of accuracy and neatness which characterizes the individual's work.	16	(12)	8	4	2
POTENTIALITIES - The individual's capacity for growth, advancement, and added responsibility; his interest in his immediate job, the work of his unit, related work, and the company; his ability to make wise decisions in the absence of detailed instructions; his judgment in situations where discretion is allowed; his initiative and leadership.	14	10	(8)	4	2
COOPERATION - The effectiveness with which the individual is able to get along with other employees - his equals, subordinates, and superiors - by tactfulness, compromise, fairness, and a sense of responsibility.	14	(10)	7	4	2
SUPERVISION REQUIRED - The resourcefulness, ingenuity, and thoroughness with which an individual carries out his job. The capability of doing a job accurately and on time without continual advice and instruction.	12	8	(6)	3	1
PERSONAL CHARACTERISTICS - The combined effect of the individual's personality and physical appearance, manner, grooming, speech, etc. on those with whom he works and/or contacts as a representative of the company.	10	(8)	6	4	2
DEPENDABILITY - The certainty of an individual's presence on the job and the individual's regard for the designated starting and departure times.	(8)	6	4	2	1

Rated By A. SUPER — Score 86

Comments of Division Head —

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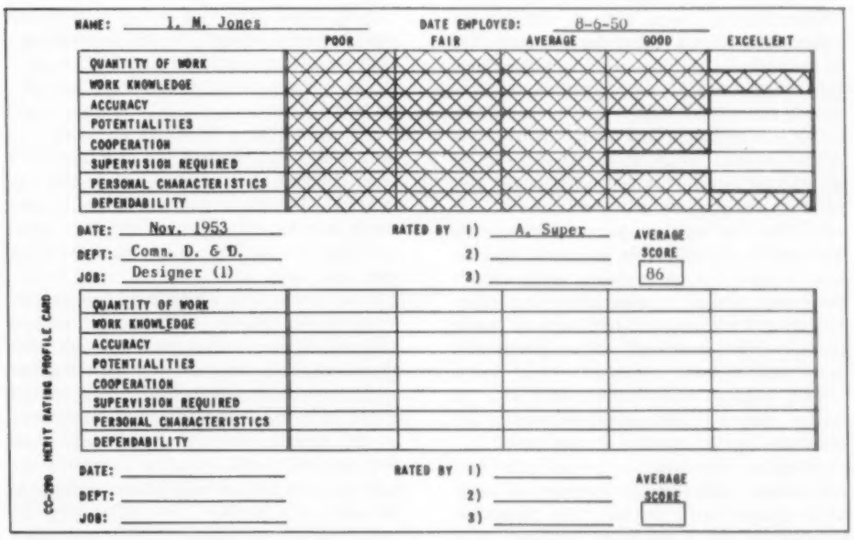

Fig. 2—Profile card prepared for discussion with employees after evaluation.

the rank order system since this did not provide us with a comparison between personnel in the segregated groups. Conceivably the individual rated "tops" by one supervisor might be equal in qualifications only to the average man in another group with stronger personnel. Therefore, we chose to employ a variation of the chart system, using our job descriptions and job analysis as the arbitrary standard by which the individual was to be measured. We selected eight factors which by broad interpretation could cover the requirements of any job in our company.

1. *Quantity of work* — The amount of work which the individual satisfactorily completes within a given period of time.

2. *Work knowledge* — The extent to which the individual understands the information which is required to perform his present job.

3. *Accuracy* — The degree of accuracy and neatness which characterizes the individual's work.

4. *Potentialities* — The individual's capacity for growth, advancement, and added responsibility; his interest in his immediate job, the work of his unit, related work, and the company; his ability to make wise decisions in situations where discretion is allowed; his initiative and leadership.

5. *Cooperation* — The effectiveness with which the individual is able to get along with other employees; his equals, subordinates, and superiors — by tactfulness, compromise, fairness, and a sense of responsibility.

6. *Supervision required* — The resourcefulness, ingenuity, and thoroughness with which an individual carries out his job. The capability of doing a job accurately and on time without continual advice and instruction.

7. *Personal Characteristics*—The combined effect of the individual's personality and physical appearance, manner, grooming, speech, etc. on those with whom he works and/or contacts as a representative of the company.

8. *Dependability* — The certainty of an individual's presence on the job and the individual's regard for the designated starting and departure times.

Each of these eight factors was measured in five degrees — excellent, good, average, fair and poor. Each degree of each factor was given a numerical value which we considered to be a measure of its importance to our company. Although these values did not appear on the form when it was given to the raters, we have shown them in the accompanying reproduction (See Fig. 1) of our rating sheet.

Many readers will take exception to our distribution of the values, as have a number of our own supervisors. It has

DESIGNER (1) **Group 6**

Job Description

Must be able to handle any design problems including layouts. Must be able to accurately check drawings. Is thoroughly familiar with company standards and specifications. Must be very accurate in all calculations. May furnish all necessary information to draftsman as delegated. Is responsible to the Design Leader for work performance.

Analys²s:

Education—Moderate

Experience—Normal

Supervision—Moderate

Personal Contacts—Moderate

Responsibility—Normal

Fig. 3—Sample description of an individual job with an analysis of educational and other requirements.

been pointed out with some justification that personal characteristics are not as important in a construction supervisor as in an engineering department supervisor. "Potentialities" was also considered as having too high a value for the measure of individuals such as telephone operators for whom actual advancement opportunities are limited.

We attempted, however, through a fuller explanation, to make clear the kind of evaluation we desired and to get the raters to apply the general terms of the rating to the various job classifications. The major step in this program was to indoctrinate the supervisors so that each employee would be rated with maximum objectivity and only on the basis of functions and requirements of his particular job classification.

The concept was emphasized that a junior engineer, for example, was to be measured only by the demands of his position as described in the job description sheet, and that no comparison was to be drawn with the abilities of senior engineers. The effect of this rating only within job classification would be that a junior engineer could score as high numerically as the company's top engineers even on matters of work knowledge and quantity of work produced. The office boy and the office manager could have the same score if they performed their special duties with the same degree of skill, industry, cooperation, etc.

It was evident that there was no panacea for evaluation. There were still the individual standards, personalities and prejudices of the supervisors which could result in one entire group being scored above or below another, or, more likely, a single individual being badly misplaced. In the case of a new employee who had worked under only one supervisor, such an individual, if he had worked under a severe rater, would suffer when matched against his equal who was scored more liberally.

To ameliorate this we prepared a trial run for the supervisors of the three segregated divisions. We sought that which, in the language of the oil refinery, is called a "Reference Fuel." A limited number of persons in most categories, by reason of longer service with the company, were known to the supervisors of all three sections. These personnel were rated by the three section heads. When the scores were reviewed, patterns were variously gratifying, bewildering and amazing.

By re-defining the basis and objectives of the rating and discussing the rating sheet and the degree standards with supervisors, we were able to reach a common understanding both as to characteristics desired and the values of the various degrees. Re-evaluation brought the divergent scores sufficiently into line to give an acceptable standard. As a result of this procedure, we felt justified in ascribing a certain validity to comparative scores of individuals rated by only one supervisor in one of the three divisions.

When the scoring was completed, we ranked all individuals within a given job classification. We did not draw sharp lines between acceptable and non-acceptable in such groups and took action only on the more obvious conclusions that could be drawn.

We felt it was reasonable to assume that salary action and up-grading were more likely to be justified within the top quarter of such a group. Those in the lower quarter might be assumed to need development or were over-classified for their ability.

The most salutary result of the review was the discussion of the result of the rating between the supervisor and his employee. The personal review with the employee of his performance and status is the type of communication necessary for the development of the individual in the promotion of general organization morale. This review was accomplished by the use of a profile chart (See Fig. 2) prepared for each individual which represented by a bar graph the average marking for the individual in each of the eight factors. The profile card also showed the numerical score, but it was not considered desirable to show the individual his ranking in the group. He was, however, advised of his group's average score so that he might know whether he was above or below the average in his classification.

By a discussion with the employee of his scoring on the various factors, it was felt that an employee could be made to recognize a weakness as judged by his supervisor and could take positive action to improve himself in this area. An individual who fails to show improvements in areas in which he is judged to have shortcomings, should be prepared for any consequences that may result from a continued unsatisfactory performance. If a termination eventuates from such failures, the employee cannot rightfully claim, as so frequently happens in termination interviews, that his supervisor had not advised him of his shortcomings.

An employee merit rating program, when properly executed, can have as much value in supervisory development as in its ostensible purpose of ranking employees in job groups. These values lie in the strengthening of management attitudes in the supervisory staff. We feel that the entire procedure of rating and reviewing the ratings with employees is very beneficial to the supervisors who participate. In the company's aforementioned rapid growth from 150 to more than 1,000 employees, it was natural that many new supervisors would be created and that these newly-employed supervisors could not be thoroughly indoctrinated into company procedures. It was consequently difficult to maintain the desirable lines of communication from management through the department supervisors to the employees. The inevitable result was frequent misunderstandings on the part of employees and often charges of unfairness in certain actions affecting individuals or groups of employees. It was unquestionably true that in many cases inexperienced or excessively busy supervisors never had direct communication with employees in their group for a period of a year or more. Nevertheless, these supervisors in that period were making judgments affecting individuals' salaries and company progress.

In preparing the merit rating of an individual in his group on the basis adopted by Catalytic, a supervisor was frequently forced to recheck his evaluation of an employee in the knowledge that he would have to support and justify his scoring of the individual to the individual himself. In certain instances, naturally enough, supervisors considered altering judgments rather than face the individual with an unpleasant appraisal. This type of evasion, however, had to be abandoned or the relative scores of the better personnel in his group would suffer by his false rating of the weaker one. The present program contemplates a merit rating of all employees each six months prior to the semi-annual salary review. There can be little doubt that the rankings within groups will have more validity as the supervisors become more practiced in the art of rating. It is presently indicated that with the continued use of the employee merit rating, understanding between employees and supervisors will be greatly improved, and a higher general morale should result. Supervisors can be expected to mature more rapidly in their responsibilities, and management will have an increasingly reliable guide in formulating judgments for personnel action.

SUNTIDE Refinery Built for Efficient Operation

General view of Suntide's 30,000-barrel refinery recently completed at Corpus Christi, Texas.

ADDING TO THE REFINING facilities of the lower Gulf Coast, the completely new plant of Suntide Refining Company at Corpus Christi, Texas, is now on stream operating on a crude oil throughput of 30,000 barrels daily.

The plant, located on Nueces Bay, is designed to produce a wide range of products and includes crude and vacuum units designed by The Lummus Company and a fluid catalytic cracking unit, HF alkylation unit, and a propylene tetramer unit, all designed by Universal Oil Products Company.

The topping vacuum unit was designed for the separation, in two main fractionating towers, of crude into straight run gasoline; a distillate fraction which was to be either jet fuel base, No. 1 fuel or diesel fuel; catalytic cracking stock and residue.

The fluid catalytic cracking unit is designed for a gas oil charge of 12,500 barrels per stream day at 75 percent conversion rate. The design coke burning capacity is 17,500 pounds per hour and the debutanized gasoline output is 6,600 barrels per stream day.

The unit is an elevated reactor type with a pressurized regenerator. It is somewhat unusual in that the reactor is supported by one of the catalyst storage hoppers. The reactor is provided with a centrally located internal catalyst stripper for steam stripping of spent catalyst.

Combined raw oil charge and recycle mix with and carry hot regenerated catalyst to the reactor. A perforated grid distributes the incoming oil vapor and catalyst in the vessel. The cracked products enter a cyclone, where entrained catalyst is separated and returned to the catalyst bed. Vapors then go to the main fractionating column for separation into gas, gasoline, light and heavy cycle oil.

The vapor recovery unit was designed for the separation of the products produced in the cat cracking unit.

The gas from the absorber tower is fed to the sponge absorber, which utilizes a cooled cycle oil from the FCC unit. The debutanizer reboiler utilizes slurry oil from the FCC unit as the hot medium.

In the HF operation, butane-butylene from the FCC unit and purchased isobutane are charged under depropanizer pressure to the alkylation unit. The unit was designed for the production of a light alkylate of a quality which, when blended with 95 percent isopentane, will meet 115/145 performance number aviation gasoline specifications.

The tetramer unit has a charge rate of 1,135 barrels per stream day. Charge stock containing 63 percent propylene is first caustic washed for sulfur removal, then water washed to remove nitrogen compounds, after which it is mixed with recycle stock and charged to the catalyst towers. C_3 dimers and trimers are recycled to the unit for further polymerization to the tetramer.

The treating facilities consist of caustic washing of several of the product streams. Storage for fresh caustic and dilute caustic are provided and the storage tanks are so manifolded that caustic of various strengths can be supplied to the caustic washers. A standard TEL blending plant completes the treating facilities.

Storage facilities for the plant consist of approximately 50 tanks having 1,400,000 barrels capacity for crude and products at the refinery; 365,000 barrels at the deep water terminal; and 160,000 barrels of rundown capacity.

Suntide has built two 14-inch and one eight-inch pipe line from the refinery to dock facilities on the Corpus Christi ship channel.

In spite of adverse conditions such as the steel strike, the plant was completed in 18 months. Due to careful design and company co-operation, the plant is being operated with fewer than 200 employees, whereas plants of this size usually require 350 employees.

The plant layout of the processing units is such as to provide space immediately adjacent to each unit for future installation of an identical or similar unit.

Suntide's operating staff includes Floyd L. Martin, president; T. C. Bodley, vice-president and secretary; H. C. Gunter, vice-president and manager; R. G. Beaver, controller; A. T. Smith, superintendent; J. E. Harrell, assistant superintendent; Joseph Shoaf, technical and processing engineer; and E. W. Patterson, sales manager.

Night view of main processing units. In foreground is 12,500 b/d fluid cat cracker with elevated reactor supported by catalyst storage hopper.

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The Common Sense of Unit Operation

By H. H. Kaveler

Presented before the Eastern Division of Production, API, White Sulfur Springs, W. Va., June 18, 1954.

THE BUSINESS of producing oil and gas is substantially different today than it was in the formative days of the industry following Colonel Drake's historic achievement in August 1859. There are at least two important differences.

First, there is now a technology of petroleum production. Oil and gas producers know something about the nature of oil and gas in the earth, have improved tools and techniques for drilling and operating wells, and know how to obtain maximum recovery of oil at lower costs to ultimate consumers. The result is that the industry has met the ever-increasing demand for more and more petroleum products at lower and lower costs. Oil and gas and the products derived therefrom are so cheap that every citizen can afford to use and enjoy the benefits of petroleum. The technology that has made this possible is the product of our system of free and competitive enterprise. The oil industry, like all industry in the United States, stands as a monument to the system of free and private enterprise which is the unique and saving feature of our form of government. No other system with equal natural resources, talent and energy and desire for improvement has succeeded, nor will it ever succeed, in creating for all its people the social benefits that make our way of life the envy of the world.

Second, the technology that has aided industry in making the natural petroleum resources available in great quantity at low cost also establishes and indicates the need for "wiser" use of the oil and gas resources of the United States. The nation has come to understand that petroleum is a vital and essential natural resource, and that it is unfortunately an exhaustible resource. Each barrel produced from within the continental boundaries of the United States represents one less barrel available to future use. Our country will never be without essential petroleum products, or appropriate and equivalent substitutes. Yet the fact is that natural petroleum has in the near future outlook no equally economical substitute for most domestic, industrial, or military requirements for fuels, lubricants and chemical synthesis. The United States as a matter of course must adopt and follow a program of conservation in respect to its petroleum resources. Conservation is understood to mean "wise use." It does not mean hoarding for an indefinite future. It means rather that the oil and gas fields of the United States should be exploited in a manner to meet the reasonable market demand for oil and gas according to sound practices and that methods should be adopted that permit production of all economically recoverable oil and gas from any known source.

The modern industry, therefore, differs from that of the pioneer industry in the sense that more and more oil must be produced at lower and lower cost from a declining potential reserve and exploitation practices should conform to conservation principles. The only way the industry can meet its obligation to conserve is to make general use of proper well spacing and unit operation and management. Both practices involve fundamentally the same basic principles. They are the heart and core of a sound oil and gas conservation policy.

The problem of conservation in petroleum production is peculiar to the United States and Canada. They are the only important oil producing countries where private ownership of oil or gas is possible under a fundamental rule of property which gives the surface owner dominion over all that lies below or above the surface, subject of course to other rules concerning the exercise of the property right. In all other important oil and gas producing countries, minerals in the earth are sovereign property.

The petroleum producing industry in

the United States, in seeking to meet its obligation to the public under a system of free and competitive enterprise, must face the fact that any individual, partnership or corporation, through fee ownership of the surface or by lease or other contract with a surface owner, has the opportunity of becoming a producer of petroleum through the simple device of boring a hole in the earth to determine whether or not commercial quantities of petroleum are present beneath lands on which the hole is bored. Colonel Drake set the example in 1859 which thousands of individuals have followed in their demand for petroleum products. It is relatively easy to become a producer of petroleum. It is a difficult task to be a conservationist.

No industrial enterprise is less well understood by the public in spite of a large-scale program of public education on the part of the industry. A recent publication by the Interstate Oil Compact Commission is a particularly significant effort to explain to the industry and to the public the basic problems in petroleum production and conservation.[1]

"Doodle buggers" and promoters prey upon the gullible who take a flyer in oil. The often outrageously inaccurate accounts of the successful "wildcatter" or of the bonanza of wealth created by a "gusher" leads the public on. The thousands of failures are not publicized and are quickly lost to memory. The romance and fiction that exist in the mind of most citizens about the oil game creates a real and serious problem for those who engage in the business of finding and producing oil.

Oil pools are owned by many individuals. A pool is seldom found entirely beneath the fee lands of one owner, or of one lessor and one lessee. Single ownership is the rule in nations where minerals are sovereign property. The diversity of ownership of an oil pool in the United States is extreme whenever a pool is found in populated areas where land is divided into small tracts, often into small town lots, or whenever surveys are irregular as in the state of Texas. Then, ownership may extend to thousands who may be fee owners, lessors, lessees, overriding royalty owners, or holders of oil payments and other types of contracts. Such owners represent every type of investor whose common motive is to make a profit from his venture. That motive, under our system of free and private enterprise, is proper and essential to maintain a flourishing petroleum producing industry. Without it the industry could not accomplish the production of petroleum in large volume at low cost. There is therefore no fault to find in the fact that oil fields are owned by many individuals. There is fault to find, however, when diverse ownership is the single barrier that prevents maximum economic recovery from any pool. What is the source of the conflict between diverse ownership and conservation principles?

When Mr. "A" has the good fortune to find commercial quantities of petroleum by drilling a hole into the earth, his enterprising neighbor Mr. "B" hopes that the petroleum bearing rock might also lie beneath his lands. Accordingly, Mr. "B" drills on his tract, and may be fortunate in finding the petroleum bearing rock present beneath his lands. That pattern of offset drilling is followed by others until finally the limits of the pool are established by dry holes or completion of marginal wells.

Petroleum is widely distributed in the earth, but is found in commercial quantity only in porous, permeable rock, when such rocks are disposed in a manner to form a natural trap for the accumulation of commercial quantities of petroleum. The requirements that the rock be porous (i.e. not solid), that the pore space be interconnected by a network of channels joining one pore space to another, as in a honeycomb structure, giving the property of "permeability" to the porous rock, and that the rock stratum have an essential structure, are necessary for the existence of commercial quantities of petroleum. Geologists are employed for the purpose of locating such rock strata in the earth. Whether or not petroleum is accumulated in commercial quantity under otherwise favorable conditions may be determined only by boring a hole into the rock. Oil and gas can be found in no other way.

The important point is that oil and gas bearing rock must be "permeable" in order that oil and gas may migrate into and collect in the trap in the first instance, and may move through the rock to be recovered from wells drilled into the rock. The porous permeable network through which a well drains petroleum from rock usually extends over an area covered by many separately owned tracts on the surface. Any well drilled into the porous permeable rock drains oil and gas and water from the entire body of permeably-connected pore space. In this sense, a deposit of petroleum in the earth constitutes a common source of supply to all the wells drilled into a pool. A "pool," or common source of supply, is the entire body of rock, the pore space of which is interconnected by a network through which oil, gas and water may move under difference in pressure.

The fact that petroleum exists in the earth in common sources of supply is firmly established by technical evidence. It is a fact that laymen generally do not understand. Any educational program designed to instruct the layman must call attention to the fact that drainage is from a "pool" into wells, wherever the well may be located within the limits of a pool.

Pioneer producers did not have to wait for the development of petroleum reservoir technology to learn that oil and gas exist in common sources of supply. They came to that knowledge through the school of hard experience. When Mr. "B" drilled a well offsetting Mr. "A" 's well, it was apparent to Mr. "A" that the productivity of his well decreased. The pioneer producers knew, as Mr. John F. Carll recorded in his memorable observations as early as 1880, that if one delayed the drilling of a tract, he might thereby suffer the drainage of substantial amounts, if not all of the recoverable petroleum from beneath his lands. The existence of petroleum in common sources of supply was quite evident to the Supreme Court of the United States when the Court stated in 1900 in Ohio Oil Co. vs. Indiana (177 U. S.190):

"No one owner of the surface of the earth, within the area beneath which the gas and oil move, can exercise his right to extract from the common reservoir in which the supply is held without, to an extent, diminishing the source of supply as to which all other owners of the surface must exercise their rights."

The ordinary lease contract requiring out of established custom or legal precedent equidistant offsets as protection against drainage is further practical evidence of the existence of common sources of supply. If wells drain only five acres, or 10, or 20, or 40, why must there be diligence in maintaining offsets? The answer, as a matter of experience, is that wells drain oil from pools not just from beneath the separate tract of land on which the well may be located. Although the surface of the land may be divided, fence lines do not extend to the subsurface. There is no barrier to hold oil or gas within the boundary of surface land to prevent the migration when a pressure difference exists in the subsurface reservoir.

The right to drill and produce is a "divided" right growing out of separate surface property rights. The thing to be divided is an entity, a common source of supply, and a unit in the earth. The inescapable consequence is that the recoverable oil and gas in any pool must be divided among those entitled to share in the production.

How may the division of a common source of supply be accomplished?

One way to divide a common source of supply is to follow a concept of property right evolved in the pioneering days when the industry and the courts had little knowledge about oil and gas in the earth. Had the courts in the early days known that petroleum is confined in common sources of supply in the earth, the great probability is that the common law and the practices it condoned would have taken an entirely different course. But under the circumstances, when Mr. "A" drilled on his lease and Mr. "B" and others drilled on their respective offsetting properties, the early courts had little knowledge to guide them in settling conflicts that arose between competing owners, and were influenced by a great deal

of fiction and fancy about oil. It was recovered through wells, but whence it came and where it went in its imagined meandering course, like wild animals of the forests, no one knew. In ignorance, the early courts resorted to a common law "rule of capture." The rule held in substance that in face of the uncertain origin of the petroleum that appeared in any well, the title to petroleum was established only by reducing oil and gas to possession on the surface. When the courts in the United States took the view as a second step in defining property rights of oil producers, an older English law, "rule of correlative rights" was discarded, not to be brought to light in connection with petroleum production until relatively recent years. The legal background of oil and gas law as it applies to the problem of dividing common sources of supply has been set forth by George W. Hazlett.[3]

The history of the producing industry from August 1859 to about 1935 reflects the consequence of dividing oil under the "rule of capture." In that period, each owner went forth to drill as many wells as his judgment might dictate, as close to his neighbor's lease as he dared, and produced wells wide open to capture as much oil as possible. At times, more oil was found and produced than the market could absorb. But producers preferred to waste oil rather than leave it in the earth to give a neighbor a chance to capture it even though the neighbor could do no more than throw it away. There was a constant cycle of "feast and famine" as free enterprise gave way to "personal" enterprise where reward went to him with the best offensive tactics. In looking back to the free and unrestrained tactics of competing lease owners operating under the principle of capture, one may be impressed by the fact that no one could follow the principle of free and private enterprise. It was more a matter of personal enterprise. The pattern of conduct in the operation of any pool was set by one owner whose conduct tied and governed all others. No one was free to follow an efficient plan of exploitation. If there was misconduct all had to participate in it or at least suffer from it.

The oil shortage that occurred during World War I, which extended through most of the decade following, brought the attention of the industry and the public to the waste occurring in petroleum production. When the oil famine of the 1920's was brought to sudden and dramatic end by the discovery of such fields as Oklahoma City, Seminole in Oklahoma, and the great East Texas field, and the United States faced another feast of oil, the need for some control to foster more conservative practices was widely recognized. The leading oil producing states followed Oklahoma's action in 1935 and passed conservation laws designed to bring a degree of economic stability to the industry and to produce a standard of conduct whereby there would be opportunity to minimize surface and subsurface waste of petroleum. The states of Texas, Kansas, Louisiana and Arkansas passed such laws. In 1935, the necessity for a national conservation program led to formation of the Interstate Oil Compact Commission.[4]

Conservation laws in the important oil producing states produced a second method of dividing common sources of supply.

An effective state conservation law limits production to reasonable market demand for oil or gas and gives to a state authority the duty and the burden of allocating market demand to pools and to wells within pools. In those states having conservation laws, the division and sharing of a common source of supply is materially influenced by whatever allocation formula is adopted by the agency from time to time. The necessity for dividing the recoverable oil cannot be escaped. Under any system of proration under law, the rule of capture is modified to the extent that a state agency seeks to set fair and equitable allowables which determine, for the most part, each owner's share in the production obtained.

Any agency that must face the conflicting claims of competing owners, each seeking regulatory rules most favorable to himself, deserves nothing other than a sympathetic appraisal of its accomplishments. Regulation under state conservation laws has brought a great measure of good to the petroleum industry in the United States. It has brought a degree of conservation of petroleum resources. It has brought forward, at least in the leading producing states (except California), the doctrine of correlative rights based upon the age-old precept that each must so use his own (property) as not to injure another, a rule of property that limits the conduct of a competitor in the struggle to capture as much as possible from common sources of supply regardless of the consequences to his neighbors.

Proration is limited in achieving maximum economic recovery by virtue of the fact that it is a system seeking to accomplish the division of a common source of supply on the basis of competitive separate surface lease operations. If the formula fixing allowables is to be fair and equitable, shall it use well potential, or acreage, or reservoir pressure, or gas-oil ratio, or some other factor in the formula? Is a flat well allowable fair? How much oil or gas should an owner be permitted to produce simply because a well was drilled on his property, even though the evidence is that substantially all the production of the wells is drained from his neighbor's land?

Proration under conservation laws stands as a bridge between what used to be under the "rule of capture" and what should be if oil and gas pools were exploited according to the best practices. Is there not a way for an owner to exercise his right to share in the production of a pool other than by drilling one or more wells on his property and having title only to the oil or gas produced from his separate land?

Who is in the best position to decide the fair and equitable share of the recoverable oil and gas of each owner in a pool? The owners themselves. After a sufficient number of wells are drilled in a pool to define the limits of a common source of supply and to provide information about the reservoir and its oil and gas content, the owners are in possession of all the facts that are necessary for them to confer and agree among themselves on the percentage of the total recoverable oil and gas in place attributable to each of the separate lands overlying the pool. As a result of such agreement on the division of a common source of supply, each owner acquires an individual interest in all future production equivalent to the contribution of his own separate property to the whole. Thereafter, the common source of supply can be managed and operated as if it were, in effect, one lease, and the barrier to efficient operation and management created by separate and competitive lease operation is forever removed. More importantly, the problem of equitably sharing production is removed from the hands of the government.

Unitization is the practice of dividing a common source of supply among those entitled to share in production before the oil and gas are recovered. It is the way to accomplish the fairest and most equitable division. It is a better way than permitting one aggressive individual to set a pattern of conduct that accomplishes sharing under the principles of capture. It is a better way than thrusting the problems of division into the hands of a governmental agency which must seek by compromise to settle conflicting claims.

The first point of common sense in unit operation is involved simply in the proposition that since there must in any event be a division and sharing of the recoverable oil and gas in any pool, why not permit the owners themselves to accomplish the division by contract between themselves before the oil and gas is produced? Such a division by agreement based on all the established facts would be the fairest and most equitable distribution that could be accomplished.

There also is an additional and very important advantage to be gained from any unit operation. A fact about petroleum production simply stated is:

Oil does not produce itself from the earth; rather, it must be expelled from rock into wells through the agency of either compressed water or gas present with oil in the rock; when a well is opened, a lower pressure point is created and the compressed gas or water, or both, in the rock surrounding the well expands, moves towards the well, drives oil ahead

(Continued on page 80)

Portland Cement From Oil Shale

By Fred Kloiber*

EXPERIMENTS CARRIED OUT in Europe have proven the commercial feasibility of using oil shale both as a fuel and an ingredient in the manufacture of Portland cement at considerable savings in production costs. In the new manufacturing method, the oil shale, which is located in relatively heavy deposits in most countries of the world, can be mined at low cost because most deposits are near the surface.

Added to this is the advantage gained from the dual function of the oil shale in cement manufacture. The organic matter present in the shale can be used as a fuel for the process of roasting cement clinkers. And since the cost of fuel represents a large share of the total production costs in current cement manufacturing methods, the use of the oil shale can save practically the entire cost of the fuels.

Further, all essential components of Portland cement are present in the ashes of the oil shales, although their actual percentages vary within wide limits. On an average, the ashes have a two to threefold excessive amount of SiO_2, Fe_2O_3 and Al_2O_3 but only a fraction of the CaO required for cement. But if a sufficient quantity of a good grade and fairly pure limestone is added to the shale to bring the percentage of the CaO up to the required 64 percent, the percentages of SiO_2, Fe_2O_3 and Al_2O_3 components are at the same time reduced. Therefore, if the right kind of shale is mixed with the right kind of limestone, the ideal composition of Portland cement can be obtained.

In considering an operation of this type it is of course necessary to obtain accurate analyses of the oil shale and limestone deposits on hand. The oil shale, in particular, must be of proper mineral composition for the cement mixture and have a sufficient content of combustible matter for use as a fuel in the roasting of cement clinkers.

Once the proper oil shale and limestone deposits are obtained, an oil shale cement factory can be simpler in operation in many respects than a normal Portland cement plant.

The soft oil shale containing the fuel is easily broken from the ground and loaded on lorries by ordinary steam shovels in open pit operation. Also the raw limestone in almost every case can be obtained from quarries in the vicinity and transported to the cement factory either by a narrow gage railroad or by a steel cable way. In many locations also, limestone containing some combustible matter is available, thus adding to the supply of fuels which can also be used for power generation. Such limestone, called Stinkkalk or Dopelkalk in Germany, has a content of organic matter of seven to 10 percent, sometimes more. The quantity of hard limestone required in an oil shale cement factory is smaller than in a normal cement plant, because the soft shale contains some calcium carbonate. The crushing plant can be designed for lighter duty.

In a normal cement factory, considerable equipment for storing and handling fuel is required:

(a) For coal as fuel: Tracks and unloading equipment, storage yards with heavy cranes sufficient for an emergency supply for about three months' operation, coal dryers, grinding mills, pneumatic dust conveyors, bins, hoppers and so forth.

(b) For fuel oil: a similar elaborate equipment is required for unloading, storing, pumping and heating the oil. Similar to the coal-fired plant, an emergency storage for three months must be kept, which requires a dead investment similar to that for coal.

If shale is used as raw material, no such fuel handling equipment nor three months' emergency stores are needed: this will result in considerable savings in capital and operation.

According to figures published by the United States Bureau of Mines, the actual cost for breaking oil shale and transporting it to the retorts at a large western experimental plant is less than 30 cents per short ton, not including the general overhead and certain extras which, however, will not amount to more than another 30 cents, making the total cost of production 60 cents at that plant. Of course this plant is equipped with modern machinery and operates on a large scale. Therefore, if we consider a cost figure of $1.00 per ton of shale at the retorts or the kilns, we can also say that the fuel contained in this shale does not cost more either. In the use of the oil shale this would make the price of the fuel as low as $.0005 per pound. Compared with a fuel oil price of say $2.50 per barrel, it would result in a saving of more than 90 percent. And if a little more than one-half gallon of oil is required to make one barrel of cement, the actual cost of the fuel per barrel of cement would be only a fraction of a cent. This makes possible a saving of something like 25 cents per barrel, permitting a reduction of more than 10 percent of the total costs including all overhead expenses and extras. The savings for a plant making 300,000 tons per year would be more than $400,000.

Due to the fact that the fuel enters the kiln mixed with the raw feed, normal rotary kilns cannot be used, because they operate in counterflow with the raw material being charged on the upper end of the kiln and the heat from the lower end. With the oil shale only a parallel flow operation is possible which is typical of the vertical kilns.

The properly crushed, screened and mixed raw material is raised by an elevator and put into a hopper on top of the

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vertical kiln from which quantities are automatically released into the kiln at fixed time intervals. The kiln is fired from the bottom, the flame bed being maintained at about the third point level of the kiln. The air for combustion enters the kiln at the bottom and is preheated on its way upward by absorbing heat from the roasted clinkers. The mass of the material is moving slowly downward, continuously discharging cooled clinkers at the bottom. Modern vertical kilns can now be operated and controlled as well as a rotary kiln and can produce cement clinkers of the same high and uniform quality. The heat requirements are lower than in a rotary kiln process because of the better possibilities for heat recovery. Also the first cost of such vertical kilns is lower than for a rotary machine. All the rest of the equipment required for a cement factory is the same in both types.

In conclusion, it can be seen that an oil shale cement factory offers a number of savings and other advantages, compared with a standard cement plant:

(1) The fuel is a part of the raw material which can be mined at very low cost, the cost for the fuel being just as low. About 90 percent of the fuel cost can be saved, which is equivalent to more than 10 percent of the price of one barrel of cement at the factory.

(2) No equipment for unloading, storing, grinding, and handling of the fuel is required, which results in considerable savings in investment. Also no personnel for operation of this equipment is needed.

(3) No capital investment is required for a three months' supply of fuels for emergency such as is necessary when using fuels from outside sources.

(4) The plant does not depend on deliveries from the outside and can be made entirely self-sufficient. This refers also to the power consumption. Electric power can also be generated in a power plant using as fuel the oil shale or gas produced from the oil shale. There are a number of power plants in some parts of the world operating satisfactorily and economically with oil shale as fuel. Of course the amount of possible savings varies with local conditions. But such a plant is not affected by price fluctuations for coal, fuel oil or power, nor by strikes or other sources of trouble which may impair the regular delivery of fuels and power.

The type of oil shale cement factory described here was tried out in Germany, first on a small scale and then on a commercial-sized basis, and proved successful in actual operation.

Three Stars for the Colonel

A NEWLY PUBLISHED volume that is both entertaining and informative to the general reader and intensely interesting to everyone connected with the petroleum industry is entitled *Three Stars for the Colonel.* The "Colonel" in this book is of course Lieutenant General Ernest O. Thompson, who won his present rank and decorations by bravery on the field of battle and by distinguished service over a period that embraced two world struggles. To those who knew him in the earlier days of his long and active career, he is still "the Colonel," which makes the title of the book highly appropriate.

In the oil industry, the Colonel's name is intimately and indissolubly associated with the development of a sane and sensible system of dealing with the nation's hydrocarbon resources. Through his long service as a member and chairman of the Texas Railroad Commission and his constant battling for sound state regulation of oil and gas production, he has added to his other titles that of "father of conservation."

Colonel Thompson's first connection with oil came at a time when the industry was in the most desperate and chaotic condition in its entire history. His boyhood years had been spent in Amarillo in the Panhandle section of Texas. He was a student in the law school of the University of Texas when the United States was drawn into World War I, promptly enlisted and was sent overseas. He returned at the end of the war with a creditable record and the rank of Lieutenant Colonel. He intended to practice law, but through handling a deal for the sale of the local Amarillo hotel,

he shortly found himself in the hotel business. In 1928 he was elected mayor and at the end of his term was reelected.

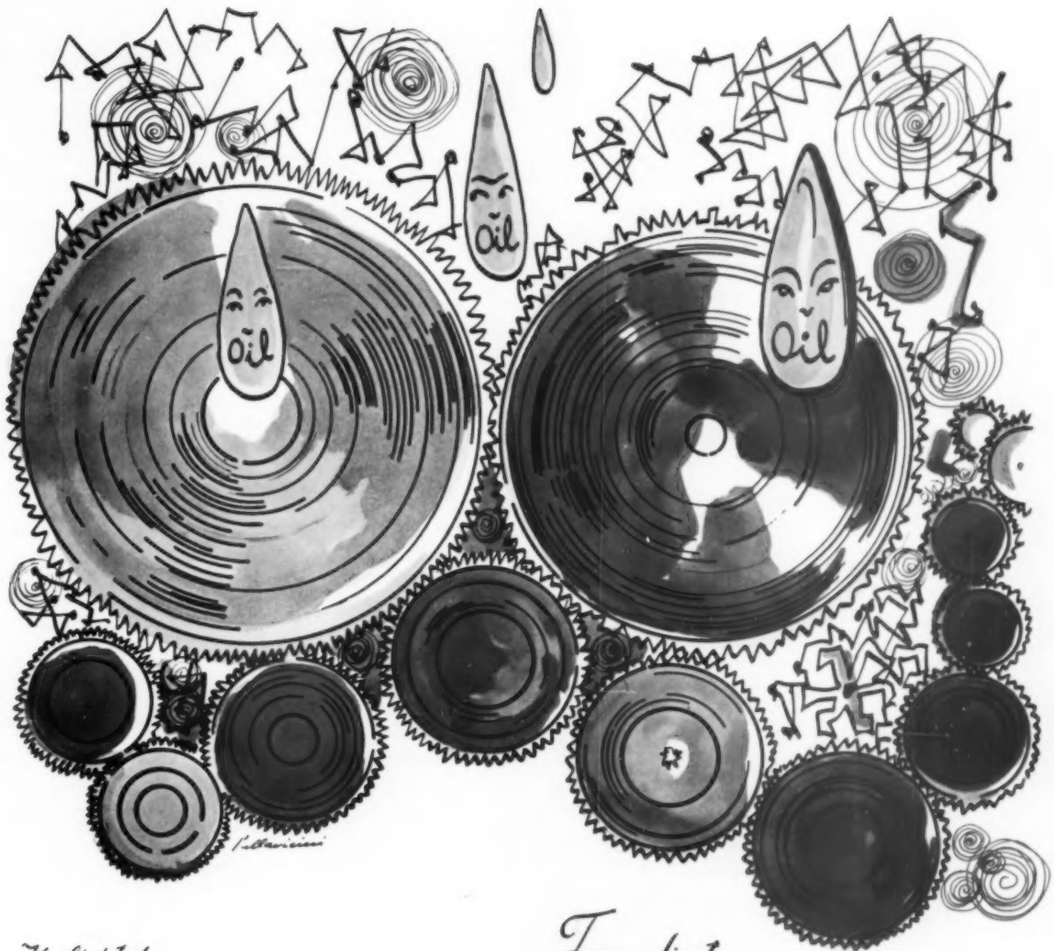
By that time the country was in the throes of the great depression. For the oil industry it was made more devastating by the flood of oil poured out by the giant East Texas field which had been discovered in October 1930. The price of oil dropped to ten cents a barrel, but producers in desperation continued to flow their wells, defied the orders of the Governor and the efforts of the state troopers sent in to execute them.

It was at this juncture, in 1932, that one of the members of the Texas Railroad Commission resigned and Governor Sterling asked the Mayor of Amarillo to accept the vacant position. He was assigned to East Texas and took his post there near Kilgore. The first pressing need was to check the flow of oil that was threatening complete ruination. On Thompson's recommendation, the legislature passed a market demand law which reinforced the commission's authority to prorate production. A federal "hot oil" law made it a penal offense to ship oil produced in violation of state proration orders and gradually an equitable system of regulation based on bottom hole pressures was built up and methods of maintaining pressure were introduced. All this was not accomplished without powerful opposition, but the Colonel had the advantage that nobody could question his sincerity. He had no axe to grind and no personal investment in oil production.

In the course of time, Thompson's reputation and influence became national and even international. He was active in the formation of the Interstate Oil Compact Commission and served as its chairman. He was a strong advocate of state authority in regulating oil and an outspoken opponent of federal intervention. In 1951 he was appointed to head the American delegation to the World Petroleum Congress at The Hague and on his return he was made the recipient of the gold medal award of the American Petroleum Institute.

A highly entertaining part of the story is that dealing with the Colonel's early days, his activities and ventures that showed his business acumen before the age of 20. As a whole, it is an absorbing narrative and an inspiring record of personal achievement and public service.

Three Stars for the Colonel, by James A. Clark; published by Random House; 265 pages; price $4.00.



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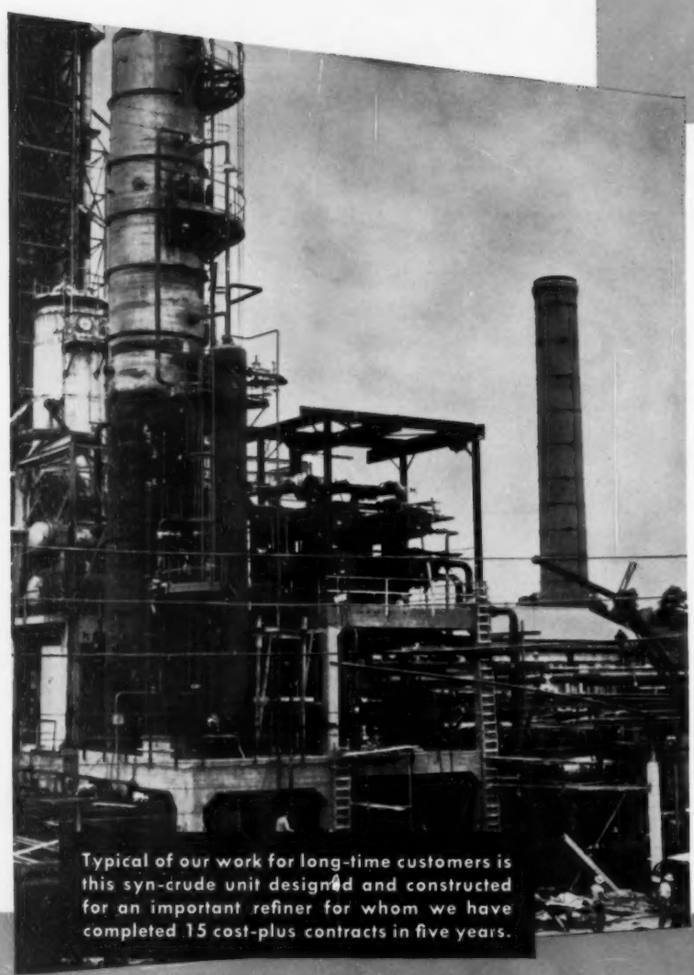

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- Atomic Energy Commission Schenectady, N. Y.
- *California Refining Company Perth Amboy, N. J.
- *Canadian Oil Refineries, Ltd. Sarnia, Ontario, Canada
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- Daikyo Oil Company Yokkaichi, Japan
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- *Leonard Refineries, Inc. Alma, Michigan
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- *Sharples Chemicals Inc. Wyandotte, Michigan
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Canadian Gas May Still Be Needed

(Continued from page 38)

feasible," although short on equity capital, which the FPC likes to be at least 15 percent. The commission said the certificate is conditional upon Pacific's filing a satisfactory financing plan. The only other condition on the certificate was that construction should start by January 1, 1955 at the latest.

William F. Davin, Seattle counsel for Pacific Northwest, has pointed out that a subsidiary of his company, Prairie Pipelines, "still has pending before the Alberta authorities a proposal to take southern Alberta gas surpluses through Pacific's transmission system to British Columbia. There is a need, now, for unity throughout the gas industry to realize the opportunities which have been created for our entire region with the decision that was announced." Beyond taking the gas to British Columbia, further, the plans of Prairie are to take it to the United States as well.

A satellite project of Pacific, that of Colorado Interstate Gas Co. to lay 365 miles of 22-inch gas pipe line at a cost of $23 million to serve Denver with more gas, was also approved by the commission.

Of Westcoast, the commission held that construction would cost more than estimated and that this might mean the company could not make the project pay.

The public interest, the commission found, calls for "a firm supply" of gas for the protection of the United States consumers. "Such protection would not be afforded if the sole source of essential natural gas were through importation from a foreign country without some inter-governmental agreement assuring the continued adequacy of its supply.

"Otherwise, all control over the production, allocation and transportation to our borders of such natural gas would be in the hands of agencies of foreign governments, whose primary interest would of necessity always be in the needs and advantages of their own people, and whose judgments and actions would be essentially dependent upon public opinion within that country.

"Regardless of any long and cherished friendly relations with any neighbor nation able to supply such area with natural gas, it would not be in the public interest to permit the importation of its gas as the sole source for consumers in need of an uninterruptible supply at a reasonable price, which should always be assured by this commission to the full extent of its powers.

"In this Pacific northwest section of our country there are potential industrial customers of natural gas whose needs will be great and who may well be supplied with imported gas on a supplementary or interruptible basis. In any area which is receiving from an American source a supply of gas sufficient for its firm needs, it is conceivable that there might be imported to it from a neighbor country upon satisfactory terms and conditions a supplementary supply of gas for its interruptible needs. We do not consider it in the public interest, however, to authorize a most important new project to serve a major area, involving a large and important segment of the American economy, which from the outset will be completely tied to and wholly dependent upon an exclusive source of supply entirely beyond the control of agencies of the United States."

New Saskatchewan Regulations

A revision of regulations governing the limitation and allocation of crude oil production under the Saskatchewan Oil and Gas Conservation Act became effective July 1, 1954. The new regulations control maximum permissive rates of production (MER). This involves recording accurately oil and gas production, water production and the gas-oil ratio.

The regulations also set out an economic allowance for producing wells. In computing the rate at which any well is allowed to produce, the economic allowable will be employed providing it is greater than the authorized maximum permissive rate.

E. D. WILSON has been appointed a management assistant in Imperial Oil's western producing division, and a member of the division management committee. He was formerly assistant manager of the Regina exploration district. Mr. Wilson was born in Gateshead, England. He left Royalite Oil Co. in 1941 to serve the R.C.A.F. Discharged in 1946 with the rank of squadron leader, he joined Imperial's producing department. In 1948 he became division petroleum engineer and in 1950 was transferred to the producing department in Toronto as operations advisor. In 1952 he became assistant manager of the Regina exploration district.

Seek Permit To Export Gas

Permission to export increased quantities of natural gas to Canada, primarily for the purpose of developing a market for the projected Trans-Canada pipe line, is sought by Panhandle Eastern Pipe Line Co. in an application filed with the Federal Power Commission.

The application would modify the contract under which Panhandle is serving the Union Gas Company of Canada Ltd. Deliveries would be increased from the present volume of 5.5 billion cubic feet to 16 billion cubic feet in the first year. This total would be gradually increased to 20 billion cubic feet.

The market to be developed for Trans-Canada is in the Ontario area. Although the new contract would run for a maximum term of 20 years, it may be terminated as soon as the Trans-Canada line goes into operation, after an initial period of two years.

"By the time the Trans-Canada pipe line is in service," said F. H. Robinson, Panhandle vice president, "we believe requirements of our customers in the United States will have increased to an extent which will absorb all of this additional gas sold to Union Gas Company of Canada. Only off-peak gas is involved in this transaction. Of course, contract commitments of Panhandle to its United States customers will be met in full before any additional gas is sent across the border." Panhandle under its present contract delivers gas to Canada through two pipe lines under the Detroit River.

DWIGHT S. SIMMONS has been appointed general manager of Imperial Oil's manufacturing department, effective August 1. He succeeds G. L. Macpherson, who was elected a member of the board of directors at the company's annual meeting in April.

Mr. Simmons has been manager of manufacturing in charge of refinery planning. He is a native of Sarnia and a graduate of Queen's University. He joined Imperial in 1932 and over the past 22 years has been responsible for much of the engineering of Imperial refinery projects. During the war he was loaned to the St. Clair Processing Corp. In 1950 he became manager of the engineering and development division of the manufacturing department. He served a year as general superintendent of Montreal East refinery, and for the past two years he has been an assistant general manager of the department.

To Build Reformer

The British American Oil Company Ltd. will install a catalytic reformer at its Calgary refinery. The new unit will be able to process about 2,000 barrels a day of straight-run gasoline, or a mixture of straight-run and thermally cracked gasoline. The reformer will be built for B-A by the Fluor Corp. of Canada Ltd. Construction will start early this fall, with completion scheduled for February 1955. The estimated cost of the process plant to be built by Fluor, together with B-A's required offsite facilities, is $725,000.

Fluor To Open Calgary Office

The Fluor Corporation of Canada Ltd. has opened a Calgary office in the Oil Exchange Building, 309 7th Street West, with C. G. Bragg as resident manager. P. D. Mellon, who has represented Fluor in the past, will continue to act in an advisory capacity. J. T. Sparling of Sparling Sales Ltd., Edmonton, will represent Fluor of Canada in that area.

E. D. Wilson

D. S. Simmons

C. G. Bragg

INTERNATIONAL NEWS AND NOTES

Fluor to Build Plant in Formosa

The Chinese Petroleum Corp. of Taiwan, through its president, K. Y. King, has placed a contract with the Fluor Corp. of Los Angeles for the engineering, equipment procurement and construction supervision of a Socony Type-45 Thermofor catalytic cracking unit for Kaohsiung refinery.

The plant will include a feed preparation and gas recovery system and will have a charging capacity of 10,000 barrels a day of which 6,500 barrels of distillate will be charged to the cat cracker reactor.

The Chinese Petroleum Corp. has been processing crude oil imported from the Middle East, in addition to small quantities of indigenous crude oil. The catalytic cracking unit engineered by Fluor is part of an extensive expansion program.

Completion of the installation is scheduled for the first half of 1955. Kaohsiung is located on the southwest coast of Taiwan.

Egyptian-American Oil Company Appointments

Appointments to key positions in the newly-formed Egyptian-American Oil Co. have been announced by manager Millard K. Neptune, former president of Platte Pipe Line Co. Egyptian-American Oil, a subsidiary of Continental Oil Co., will operate and manage the 75,000-square mile petroleum concession recently granted by the Republic of Egypt to Conorada Petroleum Corp. The concession will be assigned in the near future to subsidiaries of Continental Oil Co., the Ohio Oil Co., Cities Service Co. and Richfield Oil Corp.

William F. Penniman, who formerly represented Conorada in Cairo and who negotiated the concession, will join Egyptian-American as assistant manager in charge of financial and governmental affairs. James S. Royds, Denver, Colo., presently Rocky Mountain region exploration manager for Conoco, will become exploration manager of the Egyptian venture. Mr. Royds has been with Continental since 1939 in various phases of exploration work.

Robert Blair, Salt Lake City, Utah, division geologist for Continental, will become chief surface geologist for the Egyptian-American company. Sam Leonard, Houston, Texas, assistant director of Continental's employee benefits division, will transfer to Egyptian-American Oil Company as controller. Chief geologist for the new organization will be Don B. Eicher, who has been supervisor of exploration for Arabian-American Oil Co. in New York. Mr. Eicher spent nine years in Egypt with Standard Oil Co. of Egypt and has been with Arabian-American for the past four years.

All of the five key men, along with Mr. Neptune, will make their headquarters at Cairo.

To Explore Lower California

Petroleos Mexicanos has sent 200 men and 1,400 tons of material to La Purisima, a coastal region some 350 kilometers from La Paz, Southern Lower California, in an attempt to develop a petroleum source on Mexico's West Coast. A modern airport has been built nearby and a camp set up for workers.

Two seismologic crews are now working northwest of La Paz, and it is planned to expand these activities with the addition of a gravimetric team that will be assigned to covering the Santo Domingo section and the Hiray plains facing Magdalena Bay.

The hunt for petroleum in Lower California is being stimulated by one of Pemex's most pressing problems: how to supply northwestern Mexico. At present, Northern Lower California depends on petroleum products imported from the United States. A project for a storage base at Punta Penasco, in the State of Sonora, to receive maritime shipments which could then be sent on by rail to Mexicali, Tijuana and other points, as well as a plan to establish a similar center at Ensenada were abandoned as impractical.

Up to now, Southern Lower California and the States of Sonora, Sinaloa, Nayarit, Colima and part of Jalisco have had to be fed by an awkward distribution system involving the trans-isthmus pipe line and coastal shipments.

West Coast distribution likewise requires the constant movement of 257 tank cars with a capacity of 35,124 liters apiece, 17 tank trucks of 18,071 liters capacity each, and the seagoing tankers Poza Rica, with space for a cargo of 104,000 barrels, the Presidente Aleman, 75,000 barrels, the Cacalilao, 88,000 and the Minatitlan, 66,000 barrels, for a total of 143,000,000 liters.

East Germany Synthetic Production

A recent statement from East Berlin shows a 14 percent increase in East German production of synthetically-derived oil products as follows:

	METRIC TONS	
	1952	1953
Carburetor fuel (Gasoline)	650,000	760,000
Diesel fuel	560,000	630,000
Annual Total	1,210,000	1,390,000

Crude production was under 10,000 metric tons in 1953.

Lube Plant Nears Completion

The new lubricant plant Petroleos Mexicanos is installing in the Salamanca refinery at a cost of 250,000,000 pesos will be ready for operation by the end of September, it was announced by Pemex director Antonio J. Bermudez during an inspection of the project, termination of which will make the refinery the largest in the country.

New Show In West Australia

West Australian Petroleum Pty. Ltd., (80 percent owned by California Texas Oil Co. Ltd. and 20 percent owned by Ampol Exploration Ltd.) announced that while drilling at 9,789 feet, shows of oil were noted in the drilling mud stream at Rough Range No. 1 well. An attempt will be made to evaluate these shows by making formation tests, but due to mechanical conditions of hole, it may not be possible to obtain a satisfactory test at this time.

Rough Range No. 1 was spudded in on September 5, 1953 near Exmouth Gulf on Australia's west coast some 600 miles north of Perth. Signs of oil were noted while drilling and coring at a depth of 3,605 and 3,620 feet in late November 1953, and a test thereof in early December resulted in the first indication of oil in Australia, which has spurred the present intensive search.

Gas Turbine Shipped To Venezuela

The first of three 5,000 kilowatt gas turbines for Mene Grande Oil Company's West Guara power station in eastern Venezuela were shipped by Westinghouse Electric International Co.

The units will form part of the first independent gas-turbine central power station in Venezuela, with all electrical equipment being supplied by Westinghouse.

Weighing 118,000 pounds each, or about half as much as a comparable steam-electric unit, the turbines will be installed in a reinforced concrete structure already completed. Because of their compactness and light weight, gas turbines are relatively simple to install, and make possible a saving in power house costs. Deliveries on the other two units will be completed by fall.

Connected with Westinghouse 6,250 kva electric generators, the turbines will burn natural gas and will use only a fraction of the cooling water required by comparable thermal units. Each turbine takes in approximately 97,000 cubic feet of air per minute.

Essentially each gas turbine unit consists of three components—an axial-flow compressor, a combustion system which mixes and ignites fuel and compressed air, and a five-stage gas turbine. The West Guara units are of simple open-cycle design because of the ready availability of gas at the site, but Westinghouse also has experience on regenerative cycle units up to 15,000 kw.

Power developed by the three gas turbines will be transmitted over a Westinghouse-equipped power loop extending 40 miles south and west of the station to the San Tome oil camp, the Oficina tank farm and oil field and other points. Until now, the area has been served only by scattered gas engine generators. The initial 34.5 kilovolt system will be stepped up to 69 kilovolts as the load increases.

Westinghouse gas turbines are produced in the company's plant at South Philadelphia, Pa.

M. K. Neptune

W. F. Penniman

J. S. Royds

R. Blair

S. Leonard

D. B. Eicher

These flies are guinea-pigs

A FLOURISHING FLY FARM exists at Anglo-Iranian's Sunbury Research Station. These flies are guinea-pigs; used to measure the effectiveness of insecticides.

Developing more deadly fly-killers is but one small item among Anglo-Iranian's many activities. Others? Producing and shipping over 640,000 barrels of oil a day. Distributing the products of oil all over the world. Seeking oil for the future in places as far apart as England and New Guinea.

With refineries in seven countries and a fleet of tankers that totals nearly 2,000,000 d.w. tons, Anglo-Iranian is a major force in the world oil industry.

THE BP SHIELD IS THE SYMBOL OF THE WORLD-WIDE ORGANISATION OF

Anglo-Iranian Oil Company

LIMITED

New Canadian Crude Outlet

Western Canada crude will be delivered to Great Northern Oil Company's new refinery now under construction in the Minneapolis-St. Paul area through a pipe line hookup announced by Marlin E. Sandlin, president of Minnesota Pipe Line Co., First National Bank Bldg., St. Paul, Minn.

Medium gravity Fosterton crude will be delivered by Socony-Vacuum Oil Co. of Canada Ltd., Woodley Canadian Oil Co. and Southern Production Co. to South Saskatchewan Pipe Line Co., which is building a 16-inch line to Regina where it will connect with the Interprovincial pipe line system. Interprovincial's Lakehead extension will deliver the crude to Minnesota Pipe Line Co. at its Clearbrook Minn. station for final delivery to Great Northern's 25,000-barrel refinery.

The 260-mile Minnesota Pipe Line Co. will have an initial capacity of 35,000 barrels of crude daily. Shipments are expected to begin at 15,000 b/d on June 1, 1955 and to reach 20,000 b/d six months later. Extensions to Chicago and the Williston Basin are possibilities for the future. Storage for 400,000 barrels of crude will be erected at Clearbrook, Minn. The Minnesota line will be 16 inches in diameter. Cost is estimated at $12,500,000. Two pump stations will be built immediately.

Project engineer for the new line will be Ross Holmes of the Southern Production Co. staff. Consulting engineer will be Oscar Wolfe, recently retired from The Texas Co.

Directors of Minnesota Pipe Line Co. are: J. R. Parten, chairman of Woodley Petroleum Co.; C. T. Chenery, chairman of Southern Production Co.; Roy C. Williamson, president of Southern Production; J. T. Snyder, Jr., vice president of Southern Production; Marlin E. Sandlin, vice president of Woodley Petroleum; J. B. Cook, secretary-treasurer of Woodley; and J. Howard Marshall, vice president of Signal Oil and Gas Co.

OEEC Reports On European Consumption

Statistics prepared by OEEC (Organization for European Economic Cooperation) show that consumption of crude oil by the 16 European countries represented in the organization amounted in 1953 to 84.6 million metric tons, roundly 610 million barrels. This was a gain of 14.1 percent over consumption during the preceding year.

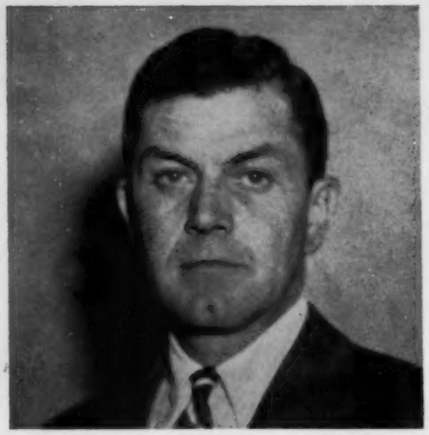
Imports of petroleum products, representing oil processed in other countries, were 24.8 million tons or about 179 million barrels, representing an equal gain percentagewise. In terms of finished products, consumption within the area was 102 million tons or about 786 million barrels, a 20 percent increase over 1952.

Of crude oil deliveries, about 80 percent came from non-dollar sources and barely 20 percent required payment in dollars. Of manufactured products, about 18.5 percent came from dollar areas. The fact that dollar oil was able to maintain a substantial volume of imports into OEEC countries in 1953 is explained as being due to the large increase in consumer requirements which outstripped the growth in refining capacity.

Middle East Oil Production

Figures of crude oil production from Middle East fields for the month of April have been reported as follows in long tons:

	APRIL 1954	JAN. TO APRIL
Iraq. Petroleum Co. (Kirkuk field)	1,892,118	7,541,619
Basrah Petroleum Co. Ltd. (Zubair field) ..	357,960	1,295,887
Mosul Petroleum Co. Ltd. (Ain Zalah & Butmah fields)	108,163	426,241
Qatar Petroleum Co. Ltd.	376,084	1,497,926
Kuwait Oil Co. Ltd. ..	3,665,011	14,330,872
Aramco (28,639,970 U. S. barrels)	3,870,266	15,444,033



J. A. Petrie

Kellogg International Vice President

James A. Petrie, Jr., who has been elected a vice president and re-elected a director of Kellogg International Corp., has recently returned to London for a brief business visit. For the past three years Mr. Petrie has served as manager of the corporation's London office. Mr. Petrie joined The M. W. Kellogg Co., of which Kellogg International is a subsidiary, in 1936. Frank E. Johnson, Jr., succeeds Mr. Petrie as manager of the London office.

Refinery For The Upper Amazon

Contract for construction of a refinery at Manaos, Brazil, has been placed by Compania de Petroleo da Amazonia with the Southwestern Engineering Co. of Los Angeles. The refinery will have a crude charge capacity of 5,000 b/d and will be complete with topping facilities, a UOP fluid catalytic cracker, treating and blending facilities, drum and can filling plant, utilities, tank farm and loading dock. Products will be gasoline, kerosine, diesel, light and heavy burner oils. Completion of the plant is expected to take place in 1955.

Southwestern Engineering will have charge of engineering, purchasing, expediting and construction. It will fabricate in its own shops the bulk of the processing equipment, including heat exchangers, columns and towers and other pressure vessels.

Located in northern Brazil, some 900 miles upriver from the mouth of the Amazon, the new refinery will be the sole producer of refined petroleum products in the Brazilian Amazon valley. It is anticipated that a portion of the refinery's output will be consumed in the middle and upper valley, with the remainder being barged down-river for distribution in Para or trans-shipment to the states of Maranhao and Ceara.

Sells LPGas Business

Tropical Gas Company, Inc., has acquired from Esso Standard Oil, S.A., its liquefied petroleum gas business in the Caribbean area and Central America. Bulk terminals are located in Puerto Rico, Haiti, Dominican Republic, Jamaica, Bermuda, Panama, Costa Rica, El Salvador and Guatemala.

Officers of the new company are: Robert T. Haslam, president; Paul K. Thompson, vice president; James Macrae, treasurer; Edward F. Clark, Jr., secretary; and John C. Harned, assistant secretary. Executive offices of the company are in Miami, Florida.

British Additives Plant

Oronite Chemical Co. and the Distillers Co. Ltd. have formed Orobis Ltd., a jointly-owned British corporation, now constructing a plant for the manufacture of lubricating oil additives at Hull, England. A complete line of lubricating oil additives as manufactured by Oronite in the United States will be manufactured and marketed by the new company.

Mexican Reserves

The petroleum reserves in Mexico's sub-soil are estimated as 17,000,000,000 barrels, or enough to last the nation for two centuries, according to a study completed recently (June 2) by Manuel J. Alvarez, president of the Mexican Geological Society.

The study was undertaken at the request of Petroleos Mexicanos.

"Not one-eighth of this country's oil lands have been tapped," the geologist reported, adding that proven reserves amount to about 2,000,000,000 barrels while the annual production is around 90,000,000 barrels.

Expressing the opinion that Mexico's oil possibilities have been "defined with sufficient precision," Mr. Alvarez nevertheless pointed out some of them have just begun to be developed.

In the Veracruz basin—considered one of the regions most important to the Mexican industry's immediate future—three geological, three seismological and one gravimetrical team are constantly at work, in addition to drilling crews. Other geological units are carrying out operations in Coahuila, Nuevo Leon, Tamaulipas, Veracruz, Tabasco, Campeche, Yucatan and Southern Baja California.

In a statement issued in connection with the Alvarez report, Eduardo J. Guzman, head of Pemex's geology department, said production from 1901 to 1938 (the expropriation year) totalled 1,875,000,000 barrels, while the known reserve was 835,000,000 barrels.

From 1938 through the end of last year, Mr. Guzman observed, the production was about 870,000,000 barrels, or approximately the same as the reserve during the previous period. The known reserve at present, he concluded, is 1,660,000,000 barrels.

To Drill In Israel

A deep test is to be spudded soon in Israel by Pan-Israel Oil Co. Inc., and Mediterranean Petroleum Corp. (Israel). Location has not yet been made, but is expected to be on one of two coastal plain tracts or the Yorkham concession in the Negev area where a test was abandoned some years ago by Iraq Petroleum Co. Core drilling now is in progress to aid in selecting a drill site.

Tri-Continent Drilling Co., Inc., a subsidiary of Pantepec Oil Co. C.A., will drill the test. Equipment now is on the ground at a base camp set up near Rehovot.

Pan Israel and Mediterranean have obtained ten concessions in Israel covering about 796,000 acres. Four are jointly owned by the two companies and each has three completely owned tracts. Both are under the leadership of William F. Buckley of Pantepec Oil and other companies.

New GSI Company

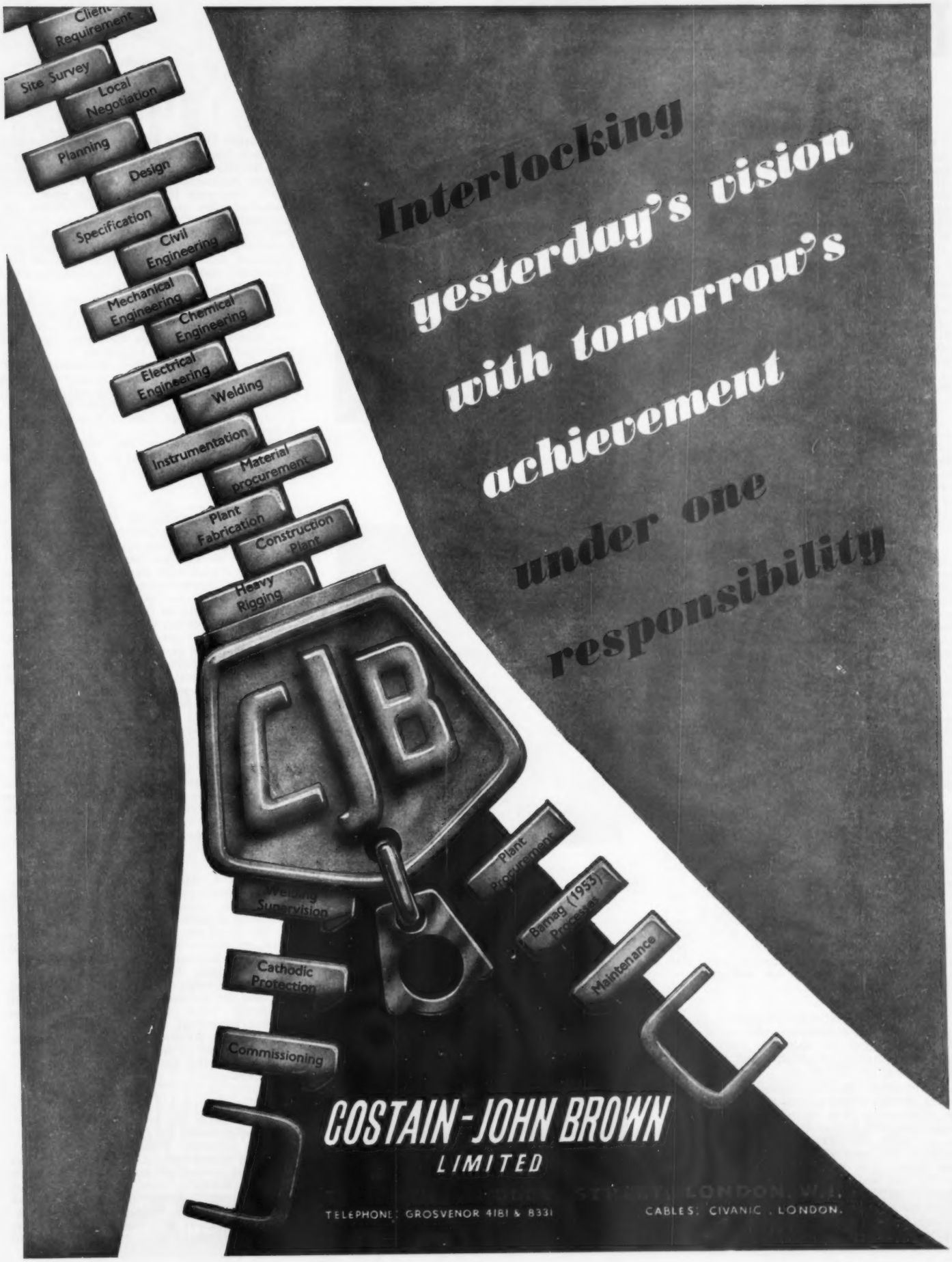
Geophysical Service, Inc. has formed an associate company for the conduct of geophysical exploration operations in Europe, Asia, and Africa. The new company is Geophysical Service (Nederland) N.V., with headquarters in The Hague, Holland. Both companies are wholly-owned subsidiaries of Texas Instruments Incorporated.

Curtis H. Johnson, a past president of the Society of Exploration Geophysicists and a widely-known authority on marine seismograph exploration, is resident director of the new GSI company. F. J. Agnich, executive vice president of Geophysical Service, Inc., is managing director.

New Pemex Terminal

Petroleos Mexicanos has completed construction of a new storage plant in the Pacific port of Manzanillo in the State of Colima, it was announced by the government oil agency.

The plant is designed to improve distribution of oil products along Mexico's West Coast, where repeated shortages have occurred in the past. It is equipped with a radio station to advise Pemex where products are needed as well as its own wharves for the landing of tankers.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OIL COMPANY STAFF CHANGES

THOMAS W. MOORE has been appointed assistant manager of the co-ordination and petroleum economics department of Standard Oil Co. (N.J.) headed by Charles J. Hedlund. Mr. Moore has been assistant general manager of the supply department of Esso Standard Oil Co. since 1953. He joined Esso Standard in 1934 as a student engineer at the Bayway refinery.

STANLEY B. CROOKS of Bartlesville, superintendent of sales and traffic for Cities Service Oil Company's gasoline-chemical division, is the recipient of the Distinguished Service Medal of the Natural Gasoline Assn. of America. The medal recognizes Mr. Crooks' 33 years as charter member of the association and his contributions to the industry in the field of committee work in traffic, technical and statistical studies.

J. B. HEID retired from Universal Oil Products Company on July 1 after 28 years with UOP. Mr. Heid began his career in the petroleum field in 1917, when he joined the old Cosden and Company at West Tulsa, Okla., as assistant mechanical superintendent. He later spent several years with the Pierce Oil Corporation in Sand Springs, Okla., as superintendent of cracking operations before joining UOP.

JOHN T. McDOWELL has been elected vice president and general manager of Cities Service Oil Co. Ltd. Together with E. D. Prentis of Toronto, vice president, treasurer and assistant general manager of the Canadian company, Mr. McDowell will direct a program of marketing expansion and development in the Ontario and Quebec Provinces of Canada. Mr. McDowell will make his headquarters at company offices in Toronto. He has 25 years of experience in the various phases of Cities Service marketing and distribution in the United States. He was named assistant regional manager of marketing at Chicago in 1950 and was elevated to the position of regional manager at Cleveland, Ohio, later. Harry F. Gould becomes regional marketing manager at Cleveland to succeed Mr. McDowell.

BRYAN S. REID, general manager of the Chicago division of Socony-Vacuum Oil Company, Inc., retired July 1 after 43 years in the oil industry. In 1911 he began working for a company drilling for oil in Cuba. In 1923 he organized the Inter Ocean Sales Corp. and served as its president until the company was sold to the Wadhams Oil Co., when he became assistant to the president of Wadhams. Subsequently Wadhams became part of the Socony-Vacuum organization. On July 1, 1932, Mr. Reid was named general manager of the Chicago division, a position he has held since that time.

WILLIAM H. PINCKARD has been elected chairman of the executive committee of California Texas Oil Co. Ltd. He continues to occupy the position of chairman of the board of directors.

Mr. Pinckard has been associated with the Caltex group of companies since 1936, when the organization was formed under the joint ownership of The Texas Co. and Standard Oil Co. of Calif. His career in the oil business began in 1917 and about three fourths of his time since then has been spent abroad in the Far and Middle East and most of the free countries of the Eastern Hemisphere.

In 1940 he was elected vice president and director of the California Texas Oil Co. Ltd. and five years later became president. He became chairman in 1950.

T. W. Moore

J. T. McDowell

W. H. Pinckard

AMMON OLSEN ACKROYD, an Edmonton attorney, has been appointed full time executive secretary of the Canadian Pipe Line Contractors Association, a new organization founded in Edmonton in April of this year by 14 Canadian pipe line contractors. Officers are: president, E. W. Costello, Mannix Ltd., Calgary; first vice president G. A. Wilkinson, Marwell Construction Co. Ltd., Vancouver; second vice president, R. K. Banister, Fulton-Banister Ltd., Edmonton; and treasurer, W. Tesluck, Canadian Construction Co., Edmonton.

Directors include: G. P. Kennedy, Missouri Valley Canadian, Vancouver; R. Jernigan, Anderson International Contractors, Ltd., Edmonton; and C. A. Callahan, Canadian Pipe Line Construction Co. Ltd., Edmonton.

Committee chairmen are: membership, C. H. Pardee, Crose-Curran Ltd., Edmonton; labor, G. A. Wilkinson, Marwell Construction Co. Ltd., Vancouver; and publicity, Ralph B. Skinner, Canadian Equipment Sales & Service Co. Ltd., Edmonton.

The new association has established permanent executive offices at 305 Northern Hardware Building, Edmonton.

HERMAN A. METZGER has been elected a director and vice president of Creole Petroleum Corp. in charge of the company's New York office. Mr. Metzger was born in New York City in 1900 and graduated from Cornell University in 1921 as a mechanical-electrical engineer. In the same year, he joined the International Petroleum Co. and for the next three years was active as construction engineer for Tropical Oil Co. in directing topographical surveys for the Andean pipe line and as construction manager of the Barranca Bermeja refinery and El Centro oil field of Tropical. In 1925 he was appointed assistant general manager of the company, and took over the functions of refinery and operations manager in that zone. From 1928 to 1936 Mr. Metzger acted as executive representative in Bogota of the Tropical Oil Co. and Andean National Corp. From 1937 to 1944 he represented the Standard Oil Co. (N.J.) in various missions in different countries of South America, but principally in Brazil and Chile. In 1944 he was appointed head of Jersey's affiliates in Argentina and Paraguay, which position he held until his transfer to Creole.

GEORGE A. ROUND, chief automotive engineer of Socony-Vacuum Oil Co., Inc., has retired from the automotive division of the lubricating department after 40 years of service. He joined the Vacuum Oil Co. in Boston as an automotive engineer in 1914. He was made chief automotive engineer for Socony-Vacuum in 1939. During World War II, Mr. Round was technical consultant on fuels and lubricants for the ordnance department of the U.S. Army. Since retirement he has become technical consultant for the lubrication committee of the American Petroleum Institute and is a member of the Society of Automotive Engineers and the American Society for Testing Materials.

J. W. NOBILE has been appointed production superintendent for the San Joaquin division of General Petroleum Corporation's production department at Taft, Calif. He has been senior production foreman for Santa Fe Springs operations since 1950. Mr. Nobile joined General in 1921. He became a lease foreman at Santa Fe Springs in 1928 and production foreman at Wilmington in 1941. He is a veteran of the U.S. Army during World War I.

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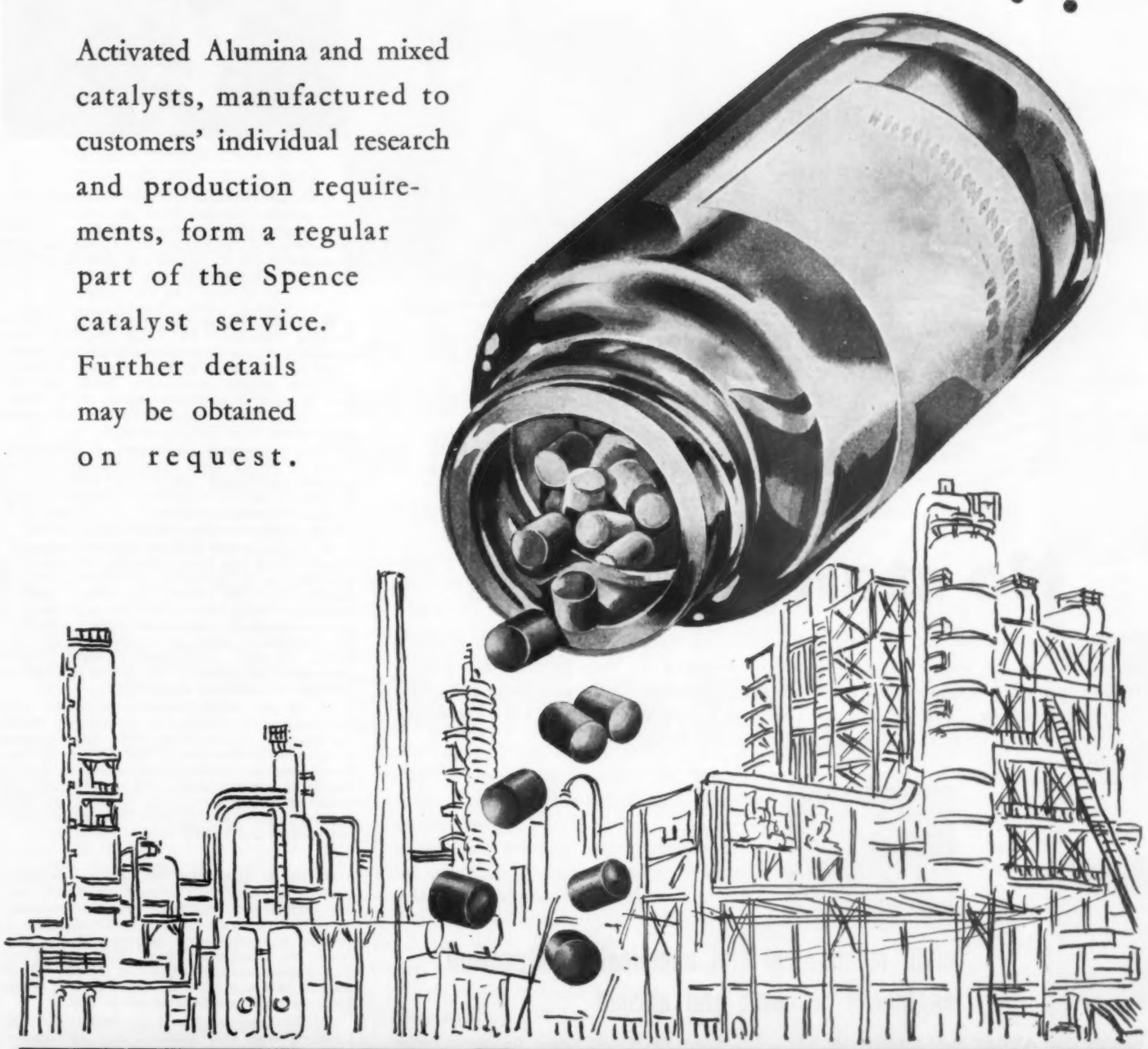

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JOHN L. FERGUSON, consulting geologist of Tulsa, Okla., has joined Buffalo Oil Co. as vice president and manager of exploration. Buffalo's main offices are now in Dallas, Texas, but the company plans to move its headquarters to Tulsa later this year.

Mr. Ferguson has served as consultant on exploratory problems since resigning early this year as vice president in charge of land exploration for Deep Rock Oil Corp. Previously, he was in exploration activities with Amerada Petroleum Corp. for over 20 years.

HENRY B. PEIFFER, assistant vice president and automotive products marketing assistant in the New York offices of Tide Water Associated Oil Company's eastern division, retired on June 30, ending 35 years of service with the company.

HAMILTON P. CALDWELL, JR., has been appointed manager of the East Providence refinery of Socony-Vacuum Oil Co., Inc. replacing Henry A. Rickett, who will serve as consultant to the refinery's management until his retirement at the end of the year with more than 40 years' service.

Mr. Caldwell joined General Petroleum Corp. in 1934 and was transferred to the company's research and development department at Paulsboro, N.J. in 1936. He became assistant superintendent at East Providence in 1953.

Mr. Rickett joined the old Standard Oil Co. of N. Y. as a research chemist in 1914 and in 1918 became assistant superintendent of the grease and compounding works in Brooklyn, N. Y. He was transferred to the East Providence refinery in 1919 and became superintendent in 1947.

G. Fisher

GERALD FISHER has been appointed pollution control co-ordinator for the General Petroleum Corp. A veteran of over 30 years with General Petroleum, Mr. Fisher has been manager of the lubricants and process products department since 1944.

M. B. HEINE, general purchasing agent of Phillips Petroleum Co. since 1948, has been promoted to manager of the purchasing department effective July 1. J. W. Proffitt, formerly assistant general purchasing agent, succeeds him as general purchasing agent. H. E. Koopman, vice president in charge of the purchasing department since 1927, has retired.

Other promotions announced by Phillips include C. W. Patchen, from buyer to assistant general purchasing agent; R. L. Robertson, L. E. Schultz and R. P. Leisure each from buyer to senior assistant purchasing agent; and D. E. Hynes, from material coordinator to buyer.

Mr. Heine joined Phillips purchasing department in 1919, two years after the company was founded, as a stationery stockroom clerk at Bartlesville. He served in various clerical capacities until 1935 when he was made a purchasing agent. Four years later he assumed the additional duties of supervising the materials division. Like several other Phillips executives, he played on the first of the famous Phillips 66 basketball teams.

All of Mr. Proffitt's company service also has been in the purchasing department, where he was first employed in 1928. After serving as a clerk in Bartlesville for a year, he was transferred to Detroit, Mich., where he was in charge of purchasing for Philgas operations. He returned to Bartlesville as a buyer in 1939, serving in that capacity until he became assistant general purchasing agent in 1948.

HUGH E. DISCHINGER, general superintendent of Shell Oil Company's products pipe line department, has been promoted to manager. He succeeds Sydney S. Smith, who is retiring after 30 years of service with the company. Mr. Dischinger joined Shell in 1924 and was named superintendent of Shell's North Line in 1940 and general superintendent of the products pipe line department in 1948.

Mr. Dischinger will be succeeded by Vern K. Leonard, who also followed him as superintendent of the North Line six years ago. Mr. Leonard, who joined Shell in 1939 and rose to be a division engineer before being promoted to his present position, will assume his new duties September 1.

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CHEMICAL PROCESS NEWS

PUBLISHED BY CHEMICAL PROCESS DIVISION, THE M. W. KELLOGG COMPANY — AUGUST 1954

NOTES ON SYNTHOL

Synthol is the name of the Kellogg-developed process for catalytically reacting synthesis gas (carbon monoxide and hydrogen) to produce a wide variety of hydrocarbon materials and chemicals. Synthesis gas for the process can be derived from either natural gas or coal.

* * *

The first plant to utilize Synthol on a commercial scale is now under construction by Kellogg in South Africa. Partial combustion of coal (from vast deposits near the plant site) will form the source of the synthesis gas; primary products of the plant will be "petroleum" fuels—around 60 million gallons per year, of which the major part will be motor gasoline.

* * *

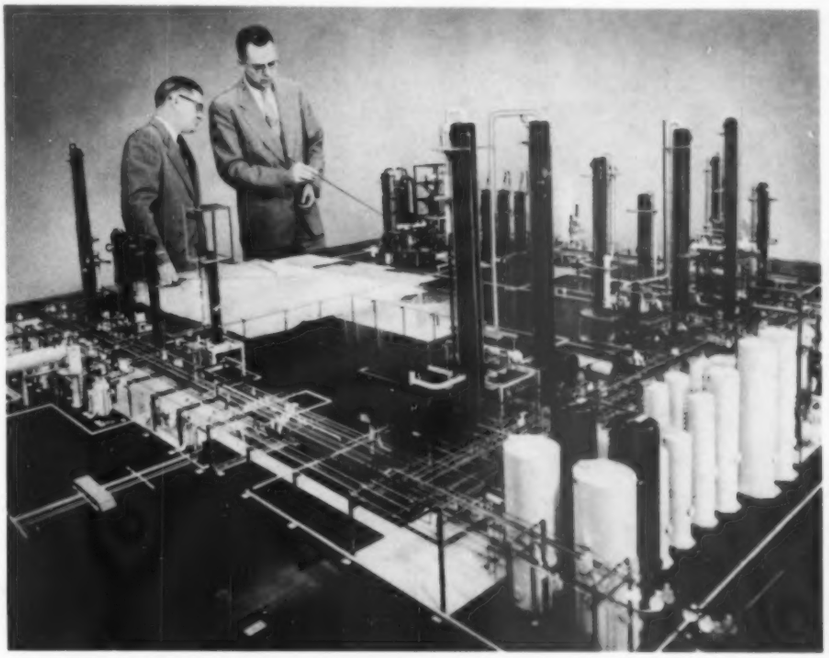
In addition to gasoline and fuel oil, the plant's output will include an impressive quantity of industrial and agricultural chemicals—about 125 million pounds. Many of these are oxygenated compounds, produced as by-products in the Synthol unit. While their volume is small in comparison with the enormous amounts of fuels produced, the higher market value of these chemicals adds substantially to the over-all attractiveness of the Synthol process.

* * *

The water-soluble or chemical stream from the Synthol unit is passed through a series of operations involving both extractive and conventional distillation to separate methanol, anhydrous ethanol, methyl ethyl ketone, and acetone. The methanol will be used as a solvent in the process and the ethanol will be blended into the gasoline pool. The other two chemicals will be marketed.

* * *

Additional equipment is being installed to produce commercial grade propanol and/or butanol, or to further process these products as additional gasoline.



Low Production Costs, High Yields and Flexible Operation Characterize New Phenol-from-Cumene Process

Shown above is a detailed model of a unique chemical plant Kellogg is currently building for Hercules Powder Company at Gibbstown, N. J. The plant will produce phenol, acetone, and methyl styrene, using the Hercules-Distillers process for oxidizing and splitting cumene. Kellogg, which developed the mechanical design of the commercial process in collaboration with Hercules, is also the originator of the process to be used for making the cumene feed.

The over-all process offers an unusual example of how refinery products can be upgraded to industrial chemicals to obtain a radical increase in value. Propylene, for example, which makes up one-third the volume of the initial feedstock, is readily available at low-cost. It can be combined with benzene by alkylation to form cumene, which is then oxidized to cumene hydroperoxide. The latter is subsequently split in a cleavage reaction to form the final products.

Of these, the phenol portion of the output is derived from the benzene part of the initial input. In the same way, the acetone produced is attributable to the low-cost propylene third of the feed.

As compared with other processes, the latter product—acetone—at present prices provides a bonus for the phenol produced as a major product. Moreover, the comparatively small quantity of methyl styrene produced can be separated and sold for use in the plastics industry, or it can be easiiy converted back to cumene and re-used in the process.

Recently completed phenol-from-cumene plant in Canada.

(continued on following page)

CHEMICAL PROCESS NEWS

CONTINUED FROM PRECEDING PAGE

Kellogg to Build Second Ethylene Plant for British Producer

Engineering is now virtually complete and construction is scheduled to begin shortly on the second ethylene plant to be designed and built by Kellogg for an important producer of chemicals in the British Isles. With a similar plant which is now under construction in Italy, the new one brings to a total of three the number of plants utilizing Kellogg's unique process for the steam-cracking of petroleum fractions to make olefins.

As embodied in these plants, Kellogg's process is characterized by high yields of high purity ethylene, and by high conversion of the feed without coking of furnace tubes. The prototype plant has now been in operation in England for more than two years and at no time has a shutdown been caused by furnace coking.

In essence, the process consists of a special high-temperature pyrolysis section in which naphtha or gas oil vapors are broken down, in the presence of steam, into ethylene and other gaseous fractions. These are then separated in a special low temperature fractionation system developed by Kellogg which allows production of ethylene of the extremely high purity needed for polyethylene manufacture. The process has demonstrated a high flexibility in both the handling of various feedstocks and in the ratios of desired products (olefins and aromatics) in the output.

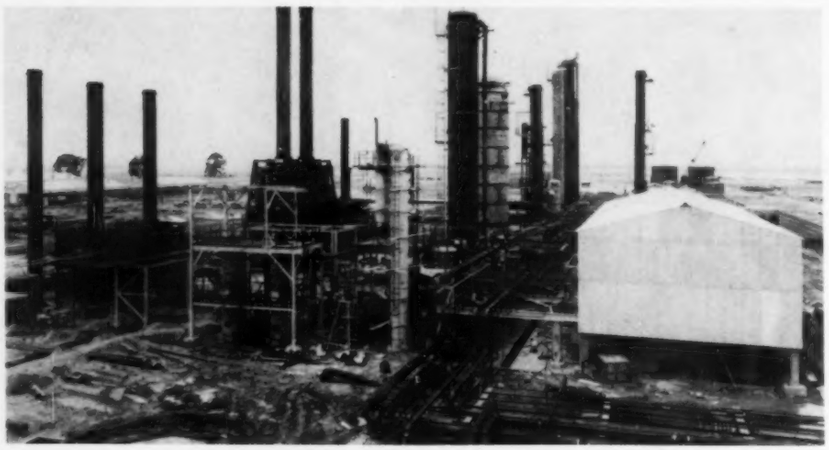
The new plant, while not a duplicate of its predecessor, will preserve the general over-all features of the first plant but will include some additional process improvements. It will be slightly larger, and, like the first plant, will crack heavy naphtha for the primary production of ethylene to be used for manufacturing polyethylene.

(continued from previous page)

Low Production Costs..

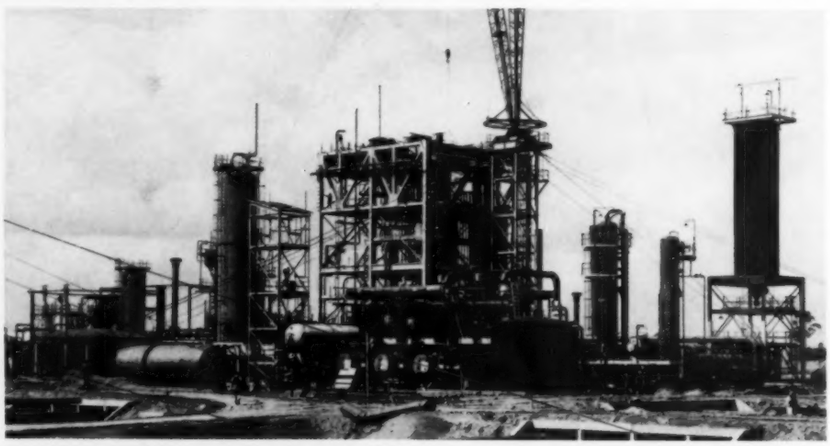
In addition to these valuable economic considerations, the process requires comparatively low initial investment and operating expense. High pressures or temperatures are not used and consumption of chemicals such as alkalis and acids is comparatively low.

Work Progresses on Sasol Plant



Shown here are two major sections of the multi-million-dollar synthesis project now under construction by Kellogg in South Africa. While the primary purpose of the plant is to synthesize gasoline and other oil products from coal, it will also produce large volumes of valuable chemicals which will be purified in Kellogg-designed equipment. (Photo above shows fractionation equipment for both oil products and chemicals.)

Shown (below) well underway is the most important unit in the process sequence. This is the Kellogg Synthol unit which will catalytically convert synthesis gas to liquid hydrocarbon and chemical products. (See preceding page for further details on Kellogg's Synthol Process.)



For further information, technical data, etc., relating to chemical or petrochemical processing, write

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- ★ Phthalic Anhydride
- ★ Liquid Fuel and Chemicals Synthesis from Coal
- ★ Glyceride Purification
- ★ Nitric Acid
- ★ Ammonium Nitrate
- ★ Ammonium Sulfate

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L. M. Berger

LEONARD M. BERGER, for the past nine years vice president and general manager of Sinclair Cuba Oil Co., S.A., has been elected president of that company. Sinclair Cuba is a subsidiary of Sinclair Oil Corp. and markets petroleum products in Cuba and the Caribbean area.

Mr. Berger succeeds L. V. Stanford, a Sinclair director who has been president of Sinclair Cuba since 1945.

C. A. DANIELS, EARL GRIFFIN and **FRANK LOVERING** have been appointed Phillips Petroleum Co. production department area managers, located at the company's headquarters in Bartlesville, Okla. They report to J. M. Houchin, general superintendent. L. E. Fitzjarrald is manager of the department.

Mr. Daniels is manager of the central area consisting of divisions headed by the following superintendents: F. W. Shelton, Wichita, Kans.; M. L. Atkinson, Ponca City, Okla.; G. J. Turner, Oklahoma City; and J. N. Perkins, Amarillo, Texas.

Frank Lovering was appointed manager of the new western area, which is being reorganized into three divisions. The northwest division, headquartered at Denver, is under Claude E. Peavy as superintendent. The present western region was divided into two divisions, both headquartered at Midland, Tex. D. A. Miller was appointed superintendent of the western division, consisting of the Odessa and West Texas districts and the Odessa servicing unit. M. R. Hayes became superintendent of the Texmex division, comprised of the Big Spring, Tex. and Hobbs, N. Mex. districts.

A. F. IMLAY has been named assistant to the treasurer of the Standard Oil Co. (N.J.). K. A. Stoecker has been promoted to foreign exchange manager and V. J. Motto to the newly created post of investment manager.

Mr. Imlay, who formerly served as administrative assistant for the department, began his career with the company in 1938. He has specialized in personnel, training, and payroll functions during his service with the company. Mr. Stoecker joined the company in 1935 and was promoted to head the investment and finance division in 1948. Mr. Motto started with Standard Oil Development Co. in 1938 and in 1941 joined the parent company in the treasurer's department.

LLOYD F. BAYER and **FERO WILLIAMS** have been appointed senior vice presidents of Tide Water Associated Oil Co., according to an announcement by D. T. Staples, president.

Mr. Bayer has been with Tide Water since October 1916, and for several years past has served as vice president in charge of the company's western division. He is also a director. Mr. Williams was elected to Tide Water's board of directors in 1952 and in May 1953 entered the service of the company as vice president and controller. Both will continue to make their headquarters in San Francisco.

FRANK V. WILLIAMS has been appointed manager of the Olean, N. Y., refinery of Socony-Vacuum Oil Co., Inc. to succeed Walter E. Wanner, who has retired after 28 years in Olean. Socony-Vacuum had announced in May that the Olean refinery was to be shut down. Mr. Williams will be in charge of this operation, after which he and other employees not eligible for special retirement or termination arrangements will be offered posts at one of the company's 13 other refineries.

Mr. Williams was formerly assistant superintendent at Olean. Mr. Wanner joined the Olean refinery as assistant to the chief engineer in 1916. He later served as chief engineer and assistant superintendent before his appointment in 1945 as superintendent. During World War II he served for several months as a petroleum analyst with the refining division of the Petroleum Administration for War.

ALFONSO HERNANDEZ, of Servicios Geofisicos, S.A., of Mexico, has signed a two-year contract with Yacimientos Petroliferos Fiscales Bolivianos to direct the latter's exploration program in El Chaco, Bolivia.

Mr. Hernandez, a geophysicist with 21 years of experience, will head a team of Mexican technicians hired by the Bolivian government oil agency. Other members are engineers Roberto Rodriguez Castro, Arturo Marin Escobar and Rafael Coria.

HOWARD C. VANHOOSER has been appointed coordinator of oil movements of Platte Pipe Line Co. He will coordinate Platte's relationships with its customer-shippers and its connecting carriers, and with other departments within Platte. Mr. Vanhooser has been revenue and oil accountant in the general office.

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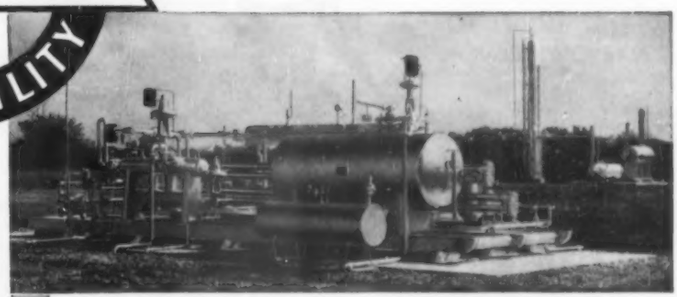

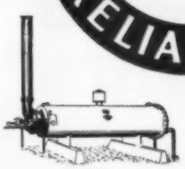
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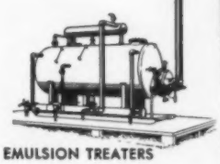
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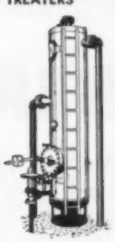
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RALPH F. MOORE has been elected president of Platte Pipe Line Co. to succeed Millard K. Neptune, who resigned to become president of Egytian-American Oil Co. with headquarters in Egypt. Before joining Platte in 1950 as vice president, Mr. Moore had been with the Sinclair companies since 1928, where he worked in various phases of the industry including manufacture of natural gasoline and the products pipe line. He supervised the construction of the Platte line, and since its completion has been vice president in charge of operations.

WILLIAM H. SPEAKER has been appointed manager of the newly created natural gas division of the producing department of Socony-Vacuum Oil Co., Inc. Mr. Speaker comes from Magnolia Petroleum Co., where he was head of the reservoir engineering section of the natural gas department.

WILLIAM L. FANNING, JR., has been appointed divisional supervisor of the crude and products section of Tide Water Associated Oil Company's eastern division. He succeeds Harold F. Parsons, who retired after 37 years of service with the company. J. H. Brown has been assigned the general administrative duties formerly handled by Mr. Parsons in connection with the operations of The Tide-Water Pipe Co. Ltd. and the Bradford Transit Co.

MANCEL E. OVERMAN has been promoted to the managership of Shell Oil Company's crude oil department. He succeeds Arthur P. Ruether, who has retired after 34 years of service with the company. Mr. Overman joined Shell in 1926 and was appointed assistant manager of the crude oil department in 1947. Mr. Ruether joined Shell in 1920 and served as a sales representative and later as manager of the firm's sales department.

W. L. Fanning, Jr.

J. H. Brown

ALBERT J. KELLY has been named general manager of the purchasing department of Esso Standard Oil Co. He succeeds Joseph M. Sitler, a director and head of purchasing, who is retiring after 33 years' service with the company.

Bertram A. Warren and John W. Rush were named assistant general manager and assistant to the general manager of purchasing, respectively.

Mr. Kelly joined the company as a buyer in 1919 and has been general purchasing agent since 1948. Both Mr. Warren and Mr. Rush have been members of the purchasing department for many years.

GUILLERMO P. SALAS, a professor in Mexico's National University School of Engineering and former chief geologist of Petroleos Mexicanos, and Ramiro Robles, also a professor of the same institution as well as a geologist on the staff of the Mexican Hydraulic Resources Ministry, have joined the Dominican Republic's oil exploration program. The Mexican scientists will be in charge of providing geological interpretations of aerial maps of Santo Domingo. Felipe Guerra Pena, another Mexican engineer, acts as oil consultant to the Dominican government and director of exploration.

LESTER C. UREN, professor of petroleum engineering at the University of California, has retired after 42 years of teaching service. Professor Uren organized the University's first petroleum engineering curriculum in 1915 and developed petroleum engineering courses that have become a pattern for similar programs in many other collegiate institutions, both in the United States and abroad. He is the author of several widely used books and many professional papers and technical journal articles on various phases of petroleum production technology. Professor Uren plans to continue his professional and journalistic activities. His address will continue to be: Mining Building, University of California, Berkeley 4, Calif.

Banks G. Moreland

Banks G. Moreland, vice president and director of Graver Tank & Mfg. Co., Inc., East Chicago, Ind., and manager of Graver's Banks Moreland division in Houston, died at his home in Houston on June 26. Mr. Moreland started his own steel fabricating company in Houston in 1922. On October 1, 1946, the Banks Moreland Co. was purchased by Graver, and henceforth was operated as a division of Graver with Mr. Moreland as its head.

Production By States

A 1954 edition of *"The Oil Producing Industry in Your State,"* a statistical reference book on oil and gas production in 27 states, has been released by the Independent Petroleum Association of America. The 80-page book features an illustrated summary of the growth and development of oil and gas production over the past quarter century. It contains complete statistical sections on each oil and gas producing state, and records the growth of the industry in all producing states from the date of first production up to January 1, 1954.

Single complimentary copies may be obtained from IPAA Information Service, P.O. Box 1019, Tulsa, Okla.

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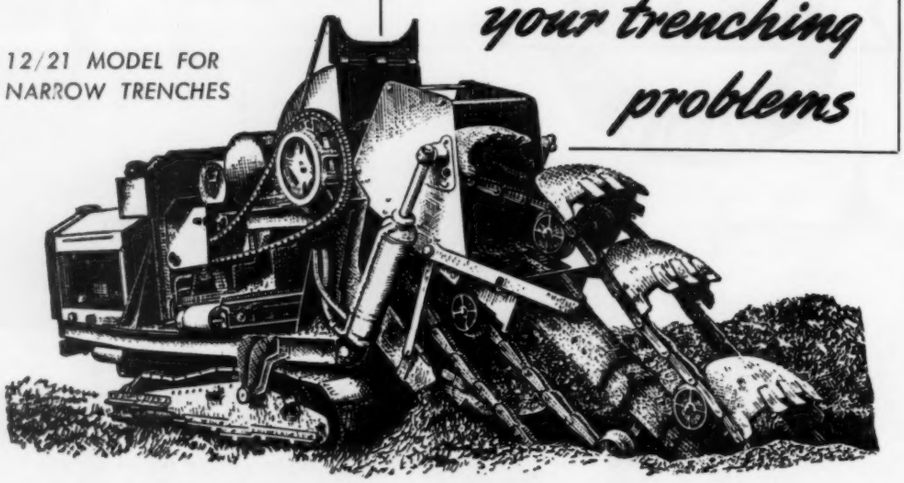

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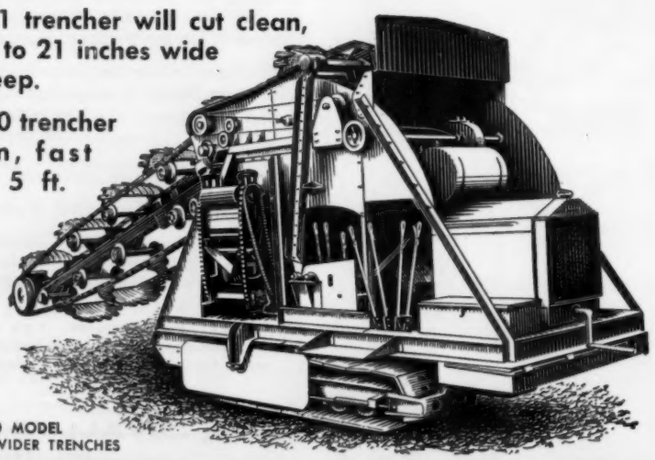

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Beaird Company Promotions

Promotion of three officers of the J. B. Beaird Company, Inc., of Shreveport, La. have been announced by J. Pat Beaird, president.

Charles T. Beaird was elevated to vice president, John L. Tullis to vice president and general manager of sales, and Melvin F. Johnson to secretary.

In addition to his new position as vice president of the Shreveport company, Charles T. Beaird is president and general manager of the J. B. Beaird Company, Inc., of California, wholly owned subsidiary located in Stockton.

Mr. Tullis is a graduate of the University of Texas and was for a number of years engineer with Texas Power and Light Co. of Dallas, Texas. He joined the Beaird sales organization in March 1947, and for the past several years has been general manager of sales. He also serves as vice president in charge of sales for The J. B. Beaird Company, Inc., of California.

Melvin F. Johnson, prominent Shreveport attorney, has served as the company's general counsel for many years and succeeds Charles T. Beaird as secretary.

Re-elected to the board of directors were: J. Pat Beaird, Charles T. Beaird, J. G. O'Brien, C. N. Wibker, J. R. Querbes, Jr., and Edward F. Nield, Jr.

To Install Houdriformer

Houdry Process Corp., Philadelphia, Pa., announces that Ashland Oil & Refining Co. has concluded licensing arrangements for a 6,000 barrel per day Houdriformer to be constructed at its Catlettsburg, Kentucky, refinery.

The Ashland Houdriformer will manufacture high grade naphtha specialties and solvents and high octane reformate for gasoline blending. Naphthas from Illinois, Louisiana, and Kentucky crude will be used as charge stocks for this unit. A Houdry-licensed cat cracker has been in operation at the Catlettsburg refinery for ten years.

J. H. Walters

T. I. Stacy

Rockwell Promotes Houston Men

Jack H. Walters, Houston district sales manager of Rockwell Manufacturing Company's meter and valve division since 1951, has been named gas products manager for the entire division and will make his headquarters at the company's home office in Pittsburgh, Pa. Thomas I. Stacy, a sales engineer in the Houston district since 1940, will replace Mr. Walters as district manager.

Cities Service Tanker Launched

The 38,000 ton supertanker SS Statue of Liberty was launched June 2 at Newport News, Virginia. It is the second of four sister ships being constructed for Cities Service Co. and Grand Bassa Tankers, Inc. These are among the largest and most powerful tankers ever built in the United States. The first of the company's four supertankers, the SS W. Alton Jones, was launched on April 20 and made her trial runs in June.

Overall length of the Statue of Liberty is 707 feet. Length between perpendiculars is 677 feet, the beam is 93 feet, the draft when loaded is 36½ feet. Her 22,000 hp engines have a speed of 17½ knots. The ship cost $9,500,000 to build, and the capacity of cargo tanks is 336,000 barrels.

Tide Water's Mid-Continent Reorganization

David T. Staples, president of Tide Water Associated Oil Co., has announced a reorganization of the mid-continent operations of the company and establishment of two division offices at Tulsa, Okla., and Houston, Texas.

J. E. Roth of Tulsa has been appointed general manager of the central division, comprising Illinois, Kansas, New Mexico, Oklahoma, Pennsylvania, North, Central and West Texas, the Rocky Mountain area and Western Canada.

The company's refinery at Drumright, Okla., and its mid-continent marketing operations will be part of the central division.

E. B. Miller, Jr., has been appointed general manager of the southern division, comprising Alabama, Arkansas, Florida, Louisiana, Mississippi, and Texas (other than North, Central and West Texas). Lloyd Armstrong of Houston, Texas, has been appointed assistant general manager of the Southern division.

BS&B Appointments

Lee Kelton has been appointed manager of oilfield sales by Black, Sivalls & Bryson, Inc. The appointment places him in charge of field and city sales activities in the company's 12 districts covering the oil country.

Mr. Kelton has been with the company since 1935 and has served the sales division in many localities as branch manager, district manager and regional sales manager. He will make his headquarters at Oklahoma City where the general offices of the oilfield sales division are located.

Black, Sivalls & Bryson also announce the appointment of Lawton L. Laurence as manager of engineering in the oilfield division. He has been with the company since 1941 except for a period during World War II when he was an officer in the U. S. Navy. He is a recognized authority on gas dehydration and low temperature separation of gas and oil condensate.

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Octane Rating Continues To Rise

Premium and regular-price motor gasolines sold at United States filling stations last winter had record-high antiknock values, according to the Bureau of Mines' semiannual survey report released by Secretary of the Interior Douglas McKay.

The report, giving results of the latest in a series of surveys made by the Bureau in cooperation with the American Petroleum Institute, shows that premium-price motor fuels sold during the winter of 1953-54 had an average research method octane rating of 91.9 and regular-price fuels averaged 84.7. Comparable values for fuels sold during the previous winter were 90.9 and 84.0, respectively. In volatility characteristics, gasolines of 1953-54 showed little change from those of the previous winter.

The 1953-54 survey was the most comprehensive of its kind ever made by the Bureau. A total of 4,680 samples, representing the products of 130 large and small companies, was collected from service stations throughout the country. Average octane ratings as determined by the motor method were 83.6 for premium-price fuels and 80.0 for regular-price fuels, compared with ratings of 82.7 and 79.1 for gasolines sold during the winter of 1952-53.

Rocky Mountain Production Data

Petroleum Information, Rocky Mountain region oil reporting service, has announced availability of the first controlled oil and gas production data for the Rocky Mountain region. Presented in four separate books, published monthly and covering various areas of the region, the report is the product of a modern and complete punch card statistical system. Both oil and gas production is presented by state, operator, field and leases. One book contains data on oil movements and purchases in Rocky Mountain fields. Statistics are assembled by field, by purchaser, pipe line connection, and refinery.

Esso Refineries Get Safety Award

President Stanley C. Hope, center left, presents to Harold G. Mangelsdorf, director and general manager of manufacturing of Esso Standard Oil Company, an award given by the National Safety Council to Esso refineries for their achievement in reducing disabling injuries during the year.

Esso's manufacturing department ranked fifth among 19 major oil companies in this class, by cutting its disabling injuries for 1953 by a third less than 1952.

Grouped around Messrs. Hope and Mangelsdorf are refinery and plant heads representing Esso's manufacturing operations. Charles Leet, general manager of East Coast manufacturing, is fourth from the right, and Stanley A. Wuchter, manager of Southern refineries, is shown at the extreme right.

To Handle Mayhew Exports

IDECO, one of the Dresser Industries, with headquarters in Dallas, Texas, has been appointed exclusive export distributor for Mayhew portable rotary drilling equipment. IDECO will also distribute the Mayhew products domestically on a non-exclusive basis, it was announced.

National Supply President

Arthur W. McKinney, who is one of the most widely known men in the oil field supply industry, has been elected president of The National Supply Co., manufacturer and worldwide distributor of oil field machinery and equipment. He succeeds Alexander E. Walker, who becomes chairman of the board and chief executive officer of the company.

Born at Olean, N. Y., Mr. McKinney was graduated from Allegheny College in 1918 and served as a lieutenant in the U. S. Signal Corps during World War I.

Starting with National Supply in 1920 following his discharge from the Army, he quickly demonstrated a native ability to make friends and to sell oilfield equipment. He won promotion to assistant manager of sales in 1929, manager of sales in 1934, general manager of sales in 1938 and vice president and general manager of sales in 1940.

Mr. McKinney is serving his second term as president of the Diesel Engine Manufacturers Association. He is a former president of the Petroleum Equipment Suppliers Association. In addition to serving as a director of The National Supply Co., he is a director of Oil Well Engineering Co. Ltd., a British firm half-owned by National Supply. He is also a director of the Ohio Citizens Trust Co., Toledo.

Rocket Fuel Plant

Standard Oil Co. (Ind.) has signed contracts with the U. S. Air Force to build and operate a pilot plant for certain new types of solid rocket propellants at Seymour, Ind. Standard will use techniques it has developed since 1951 in its research laboratories at Whiting, Ind. Propellants come largely from petroleum sources. The solid fuel burns in a closed chamber. The gas from this chamber is ejected through a nozzle to form a jet, which generates a large thrust to drive the rocket.

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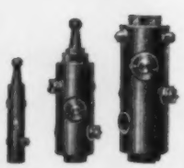

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BRITISH OIL NEWS

By E. Lawson Lomax

Qatar is probably the most primitive of all the Sheikhdoms in the Middle East. Its output of oil in 1953 was 3,997,926 tons, but at the present rate of production it will be much greater in 1954. The total population of Qatar is estimated to be between 16,000 and 18,000, although definite figures are not available.

The agreement with the Iraq Petroleum Co. and its associates is based on the same general terms as those with other countries in the Middle East, that is, an equal division of profits between the operating company and the Sheikhdom. While definite figures regarding this profit are not public property, it may be assumed that from a production of four million tons, Qatar should have an income of about £7 million ($19,670,000), a substantial amount per capita of population.

Little has been made known in the past as to the use made of these profits, but it recently was announced that a diesel power station for an electricity supply to Doha, capital of Qatar, was opened on May 25, 1954 by the ruler, Shaikh Ali bin Abdulla bin Jasim Al-Thani. Prior to this, Doha had no public electric supply and this scheme is part of the general development of the state.

Brush Export Ltd., as main contractors, was responsible for civil engineering work and the supply, installation and commissioning of the generating plant and ancillary equipment. This company also supplied and installed all the equipment for an up-to-date workshop, the complete lighting system in the power stations, workshops and offices, station cabling and earthing.

The generating sets installed are two National 4-cylinder diesel engines driving Brush alternators at 428 rpm and two 8-cylinder diesels driving Brush alternators at the same rpm. Owing to shortage of fresh water, distilled water is used in the engine jacket, and is then passed through a Fluor "Fin-Fan" air-cooled heat exchanger back to the engine jacket in a closed system; thus little makeup water is required. The power and light distribution has been carried out by British Insulated Callender Construction Co. Ltd.

By the middle of 1953, when construction was well advanced, it became evident that the original estimate for consumption was too low, and so arrangements were made for the installation of three National 8-cylinder pressure charged diesel engines driving Brush alternators, each giving a site output of 540 kw for which equipment is now arriving.

Thus the inhabitants of Doha are becoming improvement conscious and this old Arab city, which two years ago showed no signs of modernization, is awakening to the advantages of western progress.

Anti-Rust Device For Oil Tankers

A novel and relatively inexpensive anti-corrosion device has been successfully tested on the Shell tanker "Auris" during the past year and may result in substantial savings. It is known as the "Guardion" cathodic protection method developed by F. A. Hughes & Co. Ltd. of London in collaboration with Shell, and long period trials under working conditions indicate that the corrosion rate is reduced some 80 percent.

In the "Guardion" technique, an electrical current is applied to the metal of sufficient intensity to smother the inherent differences in electrical potential on the metal's surface which are the inherent causes of oxidation. In oil tankers this is achieved by magnesium anodes of special design and composition which are permanently fitted in the cargo tanks and come into operation automatically as soon as these are filled with sea water ballast.

Oil Exploration in Papua

For several years before the war, prospecting for oil was carried out in Papua, in the south-east of New Guinea. When the Japanese invaded the island in 1942, operations were abandoned, but in 1946 survey parties again set out through the swamps and jungle in an intensified effort to find oil-bearing strata. In the past eight years hundreds of square miles of jungle-covered area have been mapped and the underground formations plotted. This year £2 million ($5,600,000) is scheduled to be spent on exploration by two companies, Australasian Petroleum Co. and Island Exploration Co., both of which are jointly owned by Anglo-Iranian, American and Australian interests.

In all, the companies have drilled seven wells with a total footage of over 62,600 feet without finding oil in commercial quantities. Last year Omati test well 1 in western Papua reached a depth of 13,743 feet, the deepest well ever to be sunk in the Eastern Hemisphere. At this depth gas under pressure was encountered and the hole caved, freezing the drill pipe and bit. It is now reported that fishing operations have been abandoned, as the drill pipe was too badly distorted below 11,778 to permit further recovery to be made. Omati No. 2 has reached 4,184 feet.

In Papua, it is only possible to travel quickly or in comfort by air or water; other movement is by jungle paths laboriously cut in advance by Papuans. Helicopters are being employed for transportation of personnel, food and light equipment. In addition, the companies also use flying boats, vessels ranging from 20-ton river boats to 200-ton sea-going ships, and dug-out canoes powered by outboard motors.

Aerial Survey Conference

A conference of the aerial survey companies of the Hunting group was held in London during the week of June 21st when delegate representatives of the 21 companies comprising this group met to discuss the various aspects of aerial surveys and aerial geophysics.

The group has members registered in eleven different countries, each company carrying on aerial work in its own area.

Visit Newman, Hender Works

On June 29 a party of purchasing engineers representing the principal oil company, refinery and drilling contractors visited the works of Newman, Hender & Co. Ltd., where they were shown the various stages of manufacture of NH valves, cocks, and general fittings fabricated for use under the exacting demands of the oil industry.

Aden's First Unit Started

The first unit at Anglo-Iranian's Aden refinery has been put into commission. It is the SO_2 production plant, which produces a stock of liquid sulfur dioxide in readiness for the refinery's coming into operation in August, when the liquid sulfur dioxide will be used in the SO_2 extraction plant to produce premium and regular grade kerosine as well as blending stock for tractor fuel. The first two cargoes of oil reached Aden during the third week of July.

New Iso-Pentane Unit at Stanlow

A new plant for the production of iso-pentane is being erected at the Stanlow refinery of Shell Petroleum Co. Ltd. and is scheduled for completion early in 1955. The plant will be used for the separation of iso-pentane from debutanized light Platformate and light straight run gasoline. The working pressure of the iso-pentane column is 25 psig.

Kuwait's 10,000th Tanker Shipment

The 10,000th tanker to sail with a cargo of bulk oil from Kuwait was loaded in June 1954, almost eight years after the first shipment was made on June 30, 1946. There is at present accommodation for eight tankers simultaneously at the loading pier and in addition five submarine loading berths.

The record figure for loadings was made in 1954, when 253 oil cargoes were loaded. The average stay for all tankers at this loading station is now 18 hours.

Personnel

Sir Richard Costain, chairman and managing director of Richard Costain Ltd., was granted a Knighthood in the distribution of honors on the occasion of Queen Elizabeth's recent birthday. Sir Richard, who comes from Liverpool, is a trained craftsman. After leaving school he worked as a bricklayer and joiner and also studied architecture in Rome before joining the family business in London in 1952. During World War II he was deputy director of emergency works at the Ministry of Works and for his services there was awarded the CBE.

Richard Costain Ltd. is associated with the firm of Costain-John Brown Ltd., the well-known civil engineering contractors who have carried out civil engineering work for the oil industry in the Middle East and elsewhere.

R. E. Buell has been appointed controller of the technical division of the Regent Oil Co. Ltd. He comes to Regent from the Caltex research and development division, New York, where he has been supervisor of the products section for the California Texas Oil Co. His appointment follows the re-organization of Regent's technical services in order to bring them into line with the expansion of the company's operations.

Mr. Buell is a graduate of the Colorado School of Mines and has a petroleum engineering degree. From 1941 to 1943 he was on the research staff of the process engineering division at the Beacon Research Laboratories of The Texas Co. He then engaged in special work for the California Research Corp. (Standard Oil Co. of California) preparatory to joining the Bahrain Petroleum Co. on Bahrain Island in connection with the wartime aviation installations. He remained at Bahrain from 1944 to 1947, when he returned to the head office research and development division.

Sir Cullum Welch has joined the board of C. C. Wakefield & Co. Ltd. He has been the company's legal adviser for over 25 years. Sir Cullum succeeds upon the resignation of Holland Young Blades, who has served Wakefields ever since its foundation 55 years ago.

Sir Richard Costain

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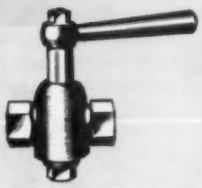
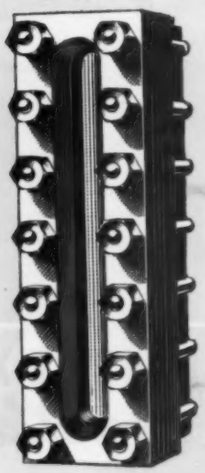
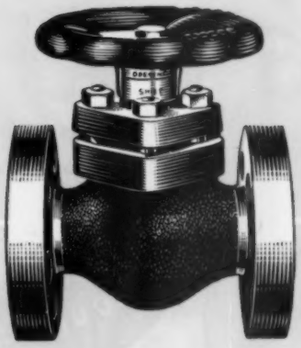




GAGES

VALVES



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J. E. Fogarty

Sulfur Data Book

The Sulfur Data Book, a new compilation of technical data on sulfur compiled by Freeport Sulphur Co., has been published by the McGraw-Hill Book Co. (140 pages, illustrated, $5).

The book marks the first time that a comprehensive collection of data on sulfur has been presented under one cover. It includes material from the literature, from private sources and from the experience gained by Freeport during 40 years of mining and research work.

The text is broken down into five major sections which present a wide range of information on the nature of sulfur, its physical and chemical properties, reaction thermodynamics, solubilities and methods of analysis.

Graver Promotions

Graver Tank & Mfg. Co., Inc. has announced a number of promotions within the company. Elected as vice president, eastern sales, is C. W. Springer, formerly eastern sales manager; J. E. Fogarty is named vice president and general manager of the mid-continent division, directing the operation of the new Graver Supply Co.; and W. T. Hudson is made vice president and manager of the Rocky Mountain and West Coast divisions. In addition, Mr. Hudson will direct operations at the new Graver plant for fabrication of field-erected tankage at Fontana, Calif.

Named as assistants to the president are J. W. Kiser, Jr., who will make his headquarters in New York; and J. W. Gosselin, whose offices will be in East Chicago. Succeeding Mr. Springer as manager of eastern sales is H. J. D'Aragon, who will continue to work out of New York City. Promoted to assistant manager of sales of the eastern division is L. J. Cogan. He has served as manager of the Philadelphia district and will continue to headquarter in that city.

LPGas Test Methods Symposium

A symposium on methods for testing liquefied petroleum gases will be held September 27-28 at the Statler Hotel, St. Louis. The symposium is jointly sponsored by ASTM Committee D-2 on Petroleum Products, ASTM Committee D-3 on Gaseous Fuels, the Natural Gasoline Association of America, and the California Natural Gasoline Association.

In addition to two full days of technical papers, there will be an interesting display of specialized LPGas testing equipment. Thus far 37 papers have been accepted for presentation. This is the first symposium of its kind dealing strictly with testing liquefied petroleum gases. Mr. B. J. Heinrich of Phillips Petroleum Co., Bartlesville, Okla., is chairman.

D. F. Taylor, Jr.

Otis Consulting Engineer

Donald F. Taylor, Jr., formerly manager of the special services department of Otis Pressure Control, Inc., is now Otis' consulting engineer for Oklahoma and West Texas. Mr. Taylor has been in Otis' engineering department for almost 15 years. He helped design many of Otis' specialized pressure control tools and dual-completion equipment.

Opens Louisiana Branch

McCullough Tool Co. has opened a new service branch at Harvey, Louisiana and appointed Orwin E. Petty as branch manager. Mr. Petty has been employed for the past four years in the McCullough eastern division headquarters at Houston in the research and development department.

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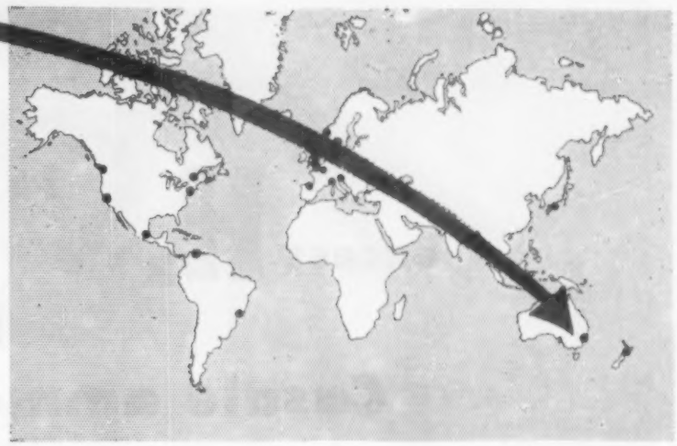

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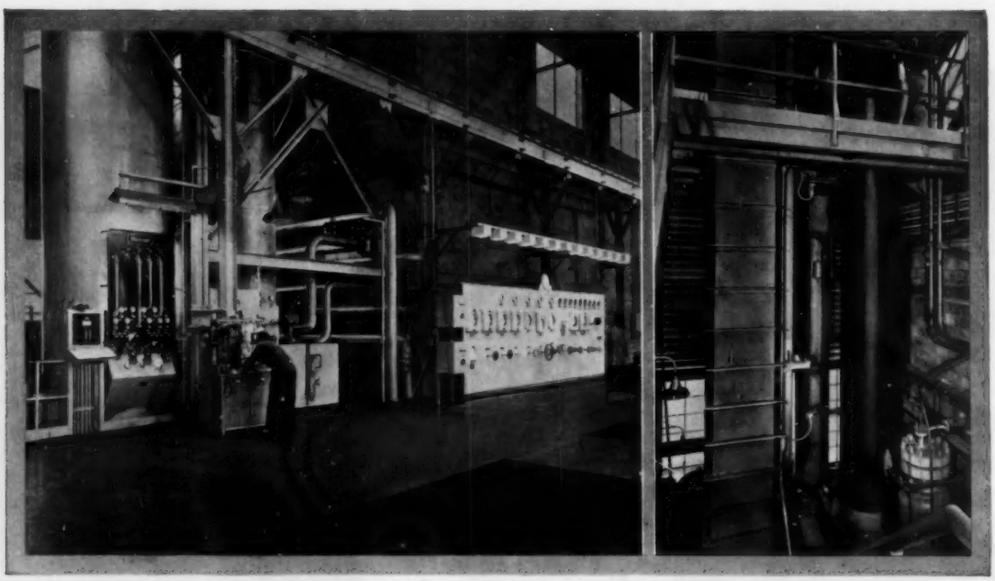

55 Tons per day of liquid anhydrous Ammonia is being produced at this new plant of the Pennsylvania Salt Manufacturing Company at Wyandotte, Michigan. The Hydrogen is a by-product from Pennsalt's adjacent chlorine plant.

The photographs show the Liquid Air Plant and the control board in the compressor building; also, the Casale ammonia condenser, deoxidation reactor and convertor.

For a general description of this installation, designed, constructed and licensed by Foster Wheeler:

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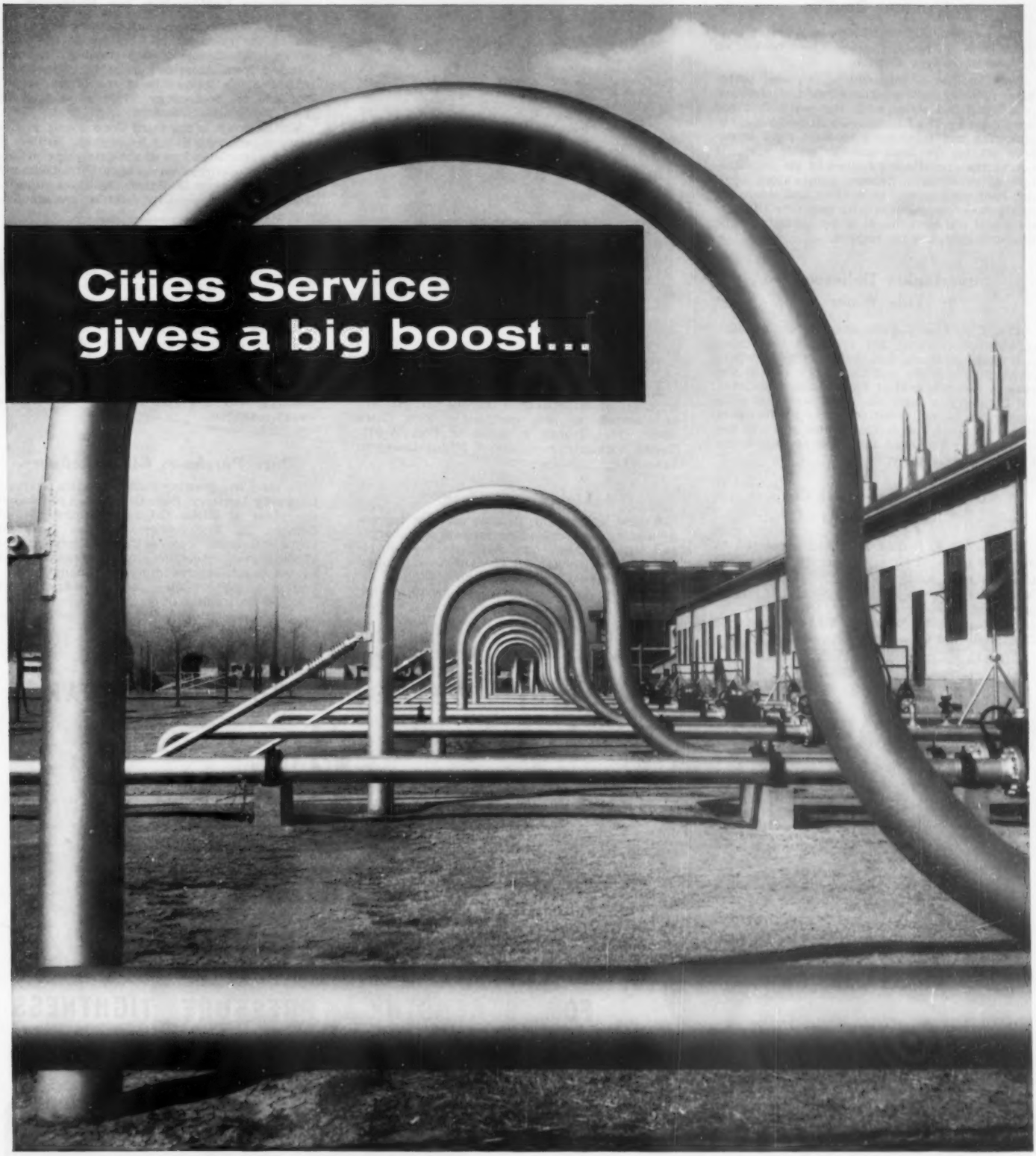

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Lummus Booklet

The Lummus Co., 385 Madison Avenue, New York 17, N. Y., has just issued a new booklet on its heat exchanger division.

This booklet is intended to acquaint petroleum refining, power generation, and chemical processing industries with the work that has been done by The Lummus Co. in designing, engineering and fabricating to meet rigid standards set up for heat transfer equipment. It covers the operations required in the manufacture of condensers, heaters, evaporators, coolers, heat exchangers, generators and steam jet refrigeration equipment with complete illustrations and photographs. It is available from the Lummus company on request.

Supertanker Delivered To Tide Water

The *S. S. Flying-A-Delaware*, a supertanker capable of carrying 200 thousand barrels of petroleum products, was delivered by Newport News Shipbuilding and Dry Dock Co. to the eastern division fleet of Tide Water Associated Oil Co. early in July. She is the second of twin tankers to be delivered this year by Newport News for service with Tide Water and was the third tanker launched this year of four being built for the company.

Distler Given Ethyl Corp. Appointment

Waldemar J. Distler has been promoted to assistant manager of sales operations of Ethyl Corp., a new position in the New York office. Mr. Distler began his Ethyl career 19 years ago as a field engineer in Dayton, Ohio. A native of Cincinnati, he attended the University of Cincinnati and Ohio State University.

J. E. George

Midcontinent Sales Engineer

J. E. George has been appointed division sales engineer of Midcontinent Supply Co. He will be located at the company's New York office. Mr. George, a native of Fort Worth, Texas, formerly represented Midcontinent in Louisiana.

Lightweight Hose

A new lightweight, flexible oil hose for use in loading and unloading tankers and barges and other dockside operations has been developed by the mechanical goods division, United States Rubber Co. The new hose, which uses lightweight steel nipples, is one-third the weight of conventional types. Further savings in weight can be achieved through the use of aluminum flanges.

Sloan Fellowship for Bateman

James W. Bateman, Houston, technical assistant to the manager of Continental Oil Company's manufacturing department, has been selected from American industry to receive a 1954-55 Sloan fellowship at the Massachusetts Institute of Technology, it is announced by L. F. McCollum, president.

Mr. Bateman is the third Conoco man in five years to receive a Sloan fellowship. William F. Brown, superintendent of the catalytic cracking division at Continental's Ponca City, Okla. refinery, and Loren D. Grubb, assistant superintendent of the Ponca City refinery, are previous winners.

Worthington Executives Move Up

L. C. Ricketts, vice-president, manufacturing, Worthington Corp., has announced the appointment of three executives to new posts. E. J. Tribble, former works manager at Harrison, N. J., has been named assistant vice president in charge of manufacturing; A. M. Tullo, former works manager at Wellsville, N. Y., becomes works manager at Harrison; and L. E. Hammer, former Wellsville assistant works manager, will take over the post of Wellsville works manager.

Pure Purchases Globe Refinery

To meet the growing demand for its products in nearby territory, Pure Oil Co. has purchased the plant of Globe Oil and Refining Co. at Lemont, Ill. The refinery occupies a site of about 250 acres and has a daily capacity of 47,500 barrels. According to an announcement by the purchaser, no immediate change in operation is contemplated and the refinery will continue to produce the usual range of products. No marketing facilities were involved in the transaction.

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Unit Operation

(Continued from page 50)

and expels the oil into the well as it enters the well along with the oil; the compressed gas or compressed water in the rock is the store of energy that accomplishes production of oil; after the oil with its accompanying gas or water driving agent enters a well, the oil may be removed to the surface by natural flow or by pumping.

This statement of fact is contrary to the popular notion that oil has a capacity to flow naturally from the earth. The public thinks of "gushers" producing oil, but not of the natural gas or water that accompanies the oil from the rock. Yet the obvious fact is that crude oil will not squirt or gush forth from containers. The gasoline in the tank of an automobile does not flow out of the filler pipe. The kerosine in a lamp must be drawn up through a wick. These products of crude oil, like crude oil itself, must be pumped or otherwise forced out of containers. Expanding gas or expanding water in the reservoir rock store and deliver the energy required to force oil out of rock into wells. Oil recovery is a displacement process. Oil to be recovered must be replaced in rock by gas or water.

One may say with certainty that when the reservoir pressure of gas or water is exhausted, then oil and gas production is exhausted, no matter what degree of oil recovery occurs up to that time. When there is no reservoir pressure, there can be little if any production, no matter how much recoverable oil may remain in the rock when that occurs.

Not all the oil or gas in a pool is recoverable. The porosity, permeability, structural attitude, depth, formation, thickness, and other characteristics of the rock determine the degree of economic recovery. The fluidity of the oil is also important. These are all factors fixed by nature beyond control or alteration by the producer. But the reservoir energy represented by gas or water under pressure in the rock with the oil is subject to control. In this respect, the owners of a pool may control the amount of and the ultimate cost of recovery.

The energy naturally present in a reservoir may be conserved by reducing the volume of gas or water produced with a barrel of oil. Or more effectively, the gas or water produced with oil may be returned to the reservoir by injection through wells selected for the purpose. In that way the natural energy of production may be artificially maintained. Water flooding, now common in the United States, is a pressure maintenance operation using water injected into the petroleum-bearing rock to drive oil to producing wells. In many pools gas is injected for the same purpose.

Thus the industry recognizes that the important step in accomplishing high recovery of the oil and gas in any pool is the maintenance of reservoir energy of production. Wells do not produce oil. Wells serve to locate petroleum in the earth. And in addition, they are a part of the mechanism to reduce reservoir pressure at a point so that the oil (or gas) may be recovered from a pool through expansion of water or gas from points of higher pressure in the rock surrounding the well.

How important is this matter of pressure maintenance? It is this important: if pools are produced in such a manner as to take only the oil that may be recovered by the energy of the gas or water naturally present, the recovery of the oil in place is usually less than 20 percent. Whereas, if reservoir energy is maintained (by artificial means if necessary), the economic ultimate recovery from an oil pool will be in the range of 50 percent to 70 percent of the oil in place. Pressure maintenance can bring about the recovery of twice to three times as much oil as might otherwise be recovered. That more oil is recoverable than is recovered by the simple act of drilling wells into a pool and taking oil by pressure depletion is evident from the substantial increases in recovery that are accomplished by water flooding otherwise depleted fields.

The fact is that recovery from a field as a whole is substantially independent of the number of wells drilled. Recovery is accomplished by reservoir energy, not by wells. When the owners of a pool come to an appreciation of this fact, they are in a position to increase the value of their productive petroleum properties. The fact that reservoir energy, not wells, is the big factor in recovery is still hidden by the fact that in a competitive race to capture oil (or gas), a well may serve the competitor as a means for dividing the common source of supply. The lease that has the most "straws in the glass" or the biggest straws, will capture the proportionately greater share of the oil (or gas). The often astonishingly large volume of recovery on some leases compared to the low volume of recovery on offsetting leases in the same pool reflects the disparity of sharing a common source of supply, not the efficiency in recovering oil or gas from a pool.

If pressure maintenance is so important to recovering oil and gas economically and in maximum amount, the layman may wonder why good business judgment does not cause all oil and gas pools to be operated on that basis. The answer to that query is that so long as owners must operate separate leases competitively, they cannot serve their own interest by maintaining reservoir pressure. Competitors, whether unrestrained in states without conservation laws or restrained in those states that have them, have only one interest. That interest is to deplete reservoir energy faster than their neighbors in order to maintain advantageous drainage from the pool to their lease. No separate owner could afford to inject gas or water or otherwise maintain pressure on his lease while his neighbors stood to gain by drainage from his higher reservoir pressure.

Thus, pressure maintenance permitting higher ultimate recovery, lower investment, lower cost per barrel of oil or cubic foot of gas produced, and higher productive capacity, can be effectively practiced only when a pool

(Continued on page 84)

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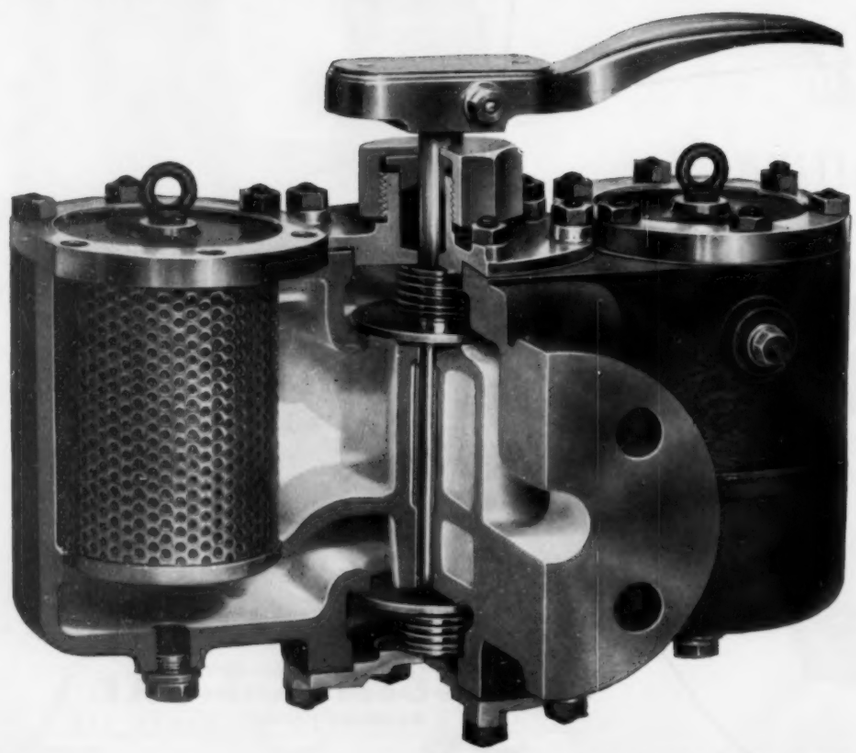

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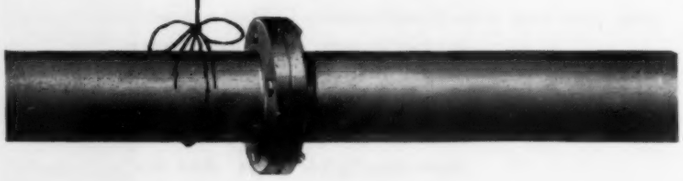

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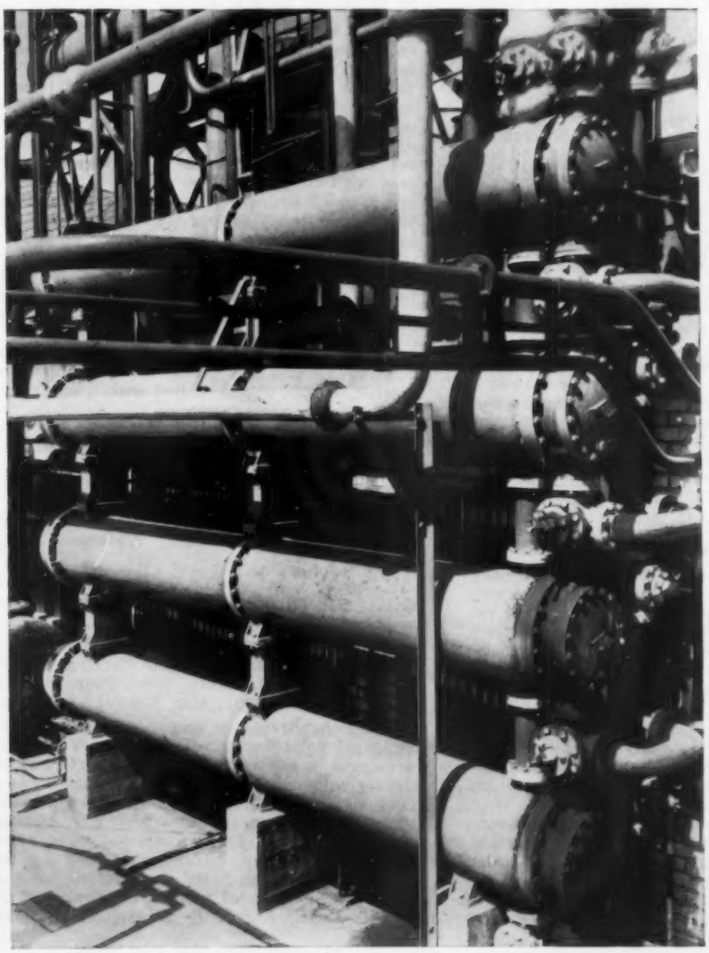

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Unit Operation

(Continued from page 80)

(or a large part of it) is operated as a unit. Only then can all the owners cooperate and manage their common property so as to obtain the maximum economic ultimate recovery. This is the second point in the common sense of unit operation.

To suggest and to propose unit operation as the practical solution to the inescapable problems of dividing a common source of supply of oil or gas and of conservation is not indulging in theory or speculation. Unit operations are by this time extensive enough to provide many examples of the fact. Unit operation is proven and practical. A survey by the Interstate Oil Compact Commission in September 1952 showed at least 173 unit operations in the United States. There are more by this time. The technical and trade journals carry frequent accounts of such projects. The states of Oklahoma, Arkansas, and Louisiana have advanced in their understanding of the conservation problem to the point where the conservation laws of the respective states make unit operation of oil and gas pools practical of attainment. The many projects in operation, in those states particularly, are contributing substantially to the economy of the local petroleum industry. It is interesting to observe that no oil or gas field presents a problem of regulation to any governmental authority after the pool is formed into a unit. A unitized pool presents no problem from the standpoint of conservation. No one destroys substance of value. After a pool is unitized and every owner within the pool has an interest in every barrel of oil or cubic foot of gas in place, there is no incentive on the part of any owner to cause waste of oil or gas. There is only a common interest, and a common effort on the part of every owner, to reduce as much of the common fund to possession as possible. No petroleum producing state can afford to be without a conservation law which encourages unit operation. It is a matter of interest that no informed oil or gas producer can bring forth a fact which denies that unit operation accomplishes all of the objectives claimed for it.

As a practical matter, no oil or gas pool is considered properly developed with the drilling and completion of only one well. There is, therefore, always the question of how many wells should be drilled into any oil and gas pool. The number and spacing of wells in any pool is a question involving the same principles of ownership and conservation that justify unit operation.

Modern technology provides a principle to be followed in determining the proper well spacing in any reservoir, expressed as follows:

(1) The wells to be drilled into a common source of supply should be spaced uniformly in so far as is practicable;

(2) That number of wells should be drilled which is required to define the limits of production to insure at least one well penetrating every productive lens or segment of the pool and to provide sufficient productive capacity to meet the existing reasonable market demand for petroleum. Any wells drilled in excess of that number are wasteful wells.

That statement of a sound and proper well spacing policy is of course diametrically opposite to the viewpoint that took root in the rule of capture requiring or permitting at least one well on each separate tract of land within the productive limits of a pool or as many wells on each tract as an owner dares to drill.

Any system of law or regulation that denies the owner of a small tract of land opportunity to recover his share of the petroleum by consolidating his land with the lands of his neighbors for the purpose of creating a tract large enough to justify the drilling of a well, deprives an owner of his property right and inevitably leads to waste. The waste is economic waste, represented by the drilling of an excessive number of wells and is physical waste when an owner is driven to drain oil not only from his small tract, but from the tract of his neighbors in order to recover investment at a profit when the recoverable petroleum beneath the land on which the well is drilled would not otherwise return a profit.

The pooling of separately owned tracts into drilling units is a sound, equitable and conservative way to bring about the development of any common source of supply. It is essential to accomplish conservation of petroleum. Whenever pooling for purposes of drilling cannot be accomplished by voluntary agreement, the need for conservation justifies enactment of state laws to require such consolidation of separate properties to accomplish proper well spacing. The leading oil and gas producing states have well spacing provisions in state conservation laws.

The need for sound and proper regulation of well spacing is well demonstrated in the eastern area of the United States. No more impressive example of economic waste may be cited than that incident to the development of the deep gas reservoirs in Pennsylvania and Maryland in recent years. In the South Leidy, or Tamarack, pool in Pennsylvania, one may cite the example of two tracts of 35 acres each which were divided into 5-acre tracts for the purpose of drilling a deep gas well on each. The 14 gas wells so drilled were produced without restriction with the result that the wells were soon drowned out by encroaching salt water. By comparison, the main Leidy pool immediately to the north was developed on substantially one well to 100-acre spacing without loss in ultimate recovery and with substantial improvement in the performance of the reservoir.

Another example is the Oriskany gas reservoir in the Benezetta township pool in Elk County, Pennsylvania. In that pool 50 wells were drilled on an area of about 640 acres, representing about one well to each 13 acres. In the remaining 43,000 acres of the pool, wells are drilled approximately one to each 160 acres. The history of the densely drilled part of the pool with the excessive and disproportionate taking of gas reflects the occurrence of wasteful practices.

In Maryland, the Mountain Lake Park gas field with 58 wells drilled on 850 acres stands as a prime example of economic folly in the petroleum producing industry. After five years, 22 wells remain as producers. The overall field development based upon the costs of the wells drilled and the gas produced and sold stands as a very substantial financial loss.

Such examples of ill-advised well spacing sponsored by a competitive effort to drain as much as possible from an entire common source of supply by an unrestrained right to drill, raises a serious question. Who pays the price of improper well spacing? Whose loss is it when wells are drilled simply as a device to profit from promoting a venture or to capture more than the amount of oil or gas that lies recoverable beneath the tract on which the well or wells are drilled? The inescapable answer is that the public pays the price for such economic folly in higher prices for petroleum products. And, more importantly, the nation pays a price in the inevitable physical and economic waste of an exhaustible and irreplaceable vital resource. It would seem that the time has come when every state must face its obligation to conserve oil and gas resources, through law if necessary, in order that proper well spacing and unit operation may be more generally adopted as the only practical way to accomplish wise use of the valuable petroleum resource, while preserving the rights of owners within the basic precepts of the doctrine of correlative rights.

Anyone who is an advocate of unitization and proper well spacing is likely to encounter the viewpoint in some areas that it is too late in that particular area to adopt the best practices. But is it too late? Many fields otherwise depleted by competitive operations may be caused to yield once again as much oil as they produced through the device of water flooding or repressuring with gas. Further, no state in a petroleum province may neglect the fact that as the industry progresses, exploration for oil goes to deeper and deeper horizons and new pools are to be found. Certainly no state with oil and gas production possibilities can ignore the fact that it is the better part of wisdom to be prepared with a sound and useful law promoting the conservation of its oil and gas resources. Waste has the element of finality. It is not eliminated by *post facto* remedies. Petroleum is of such value that not even one oil or gas pool should be subject to wasteful practices for want of proper state regulation.

Henry L. Doherty is generally credited and well deserves the credit for bringing unit operation to the attention of the oil industry and the public. In 1924 he had the courage to advocate unit operation as the only sound and reasonable means of accomplishing the conservative development of the petroleum resources of the United States. Yet, without detracting in any way from Mr. Doherty's contribution, one should give credit to John F. Carll, who as early as 1880 expressed the entire idea embodied in modern unit operation practices when he said:[2]

"If one company owned all the wells drawing upon a pool and had accurate records of the depths and characteristics of the oil producing stratum in each well, it is quite possible that some system might be devised by which water could be let down through certain shafts and the oil forced toward certain other shafts where the pumps were kept in motion and thus the rocks be completely voided of oil and left full of water. As it is, however, no systematized plan of action can be adopted. The careless handling of one well by which water is let down to the oil rock may spoil several others belonging to different parties. A clashing of interests at once arises and is likely to result in disaster to the whole district."

It is the clash of interests seeking to divide a common source of supply of oil and gas that results in waste and injury to the majority of owners in a pool and results in pressure depletion and the recovery of less than the maximum economic recovery from the oil and gas pools in the United States. At a time when the nation is well advised on and accordingly promotes under law, conservation programs to conserve the soil, the forests and the surface water, is it not time, on the basis of equivalent knowledge, for similar measures to be imposed for the purpose of conserving valuable petroleum resources? If a state must amend its long-standing legal precepts based upon the rule of capture which fosters waste of petroleum, and adopt a more modern conception involving the rule of correlative rights, is it not time that that be done so long as there are any oil and gas resources to be exploited within the state? Proper well spacing and unit operation and management of common sources of supply is the common sense answer to the need for conservation of petroleum. No state, having adopted such practices under law, has ever had reason to repeal the law nor has industry sought to repeal such laws. Thus, it is established that such better ways of exploiting oil and gas pools, the common sense method, can be accomplished within the framework of the constitution of the Republic and within the long-standing concepts of the legal right of owners under our system of free and competitive enterprise.

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[3] *Conservation and Property Rights*, George W. Hazlett, Thirtieth Annual Meeting, American Petroleum Institute, Production Bulletin 236, pp. 13-23 (1950); also, Ref. (1) pp. 34-45.

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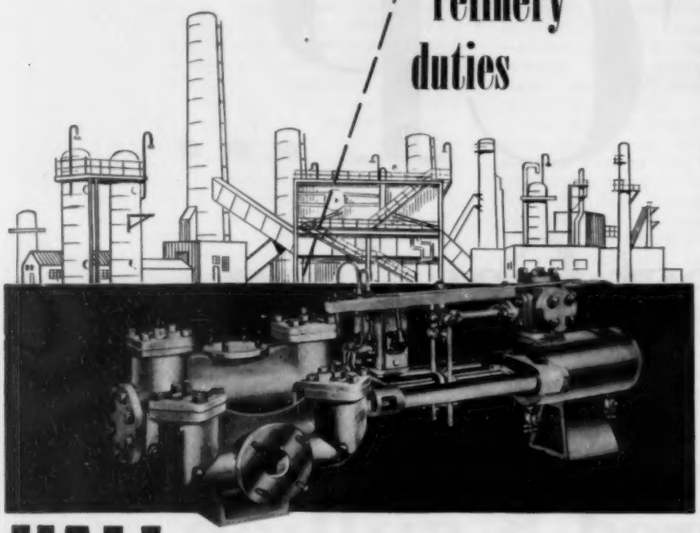

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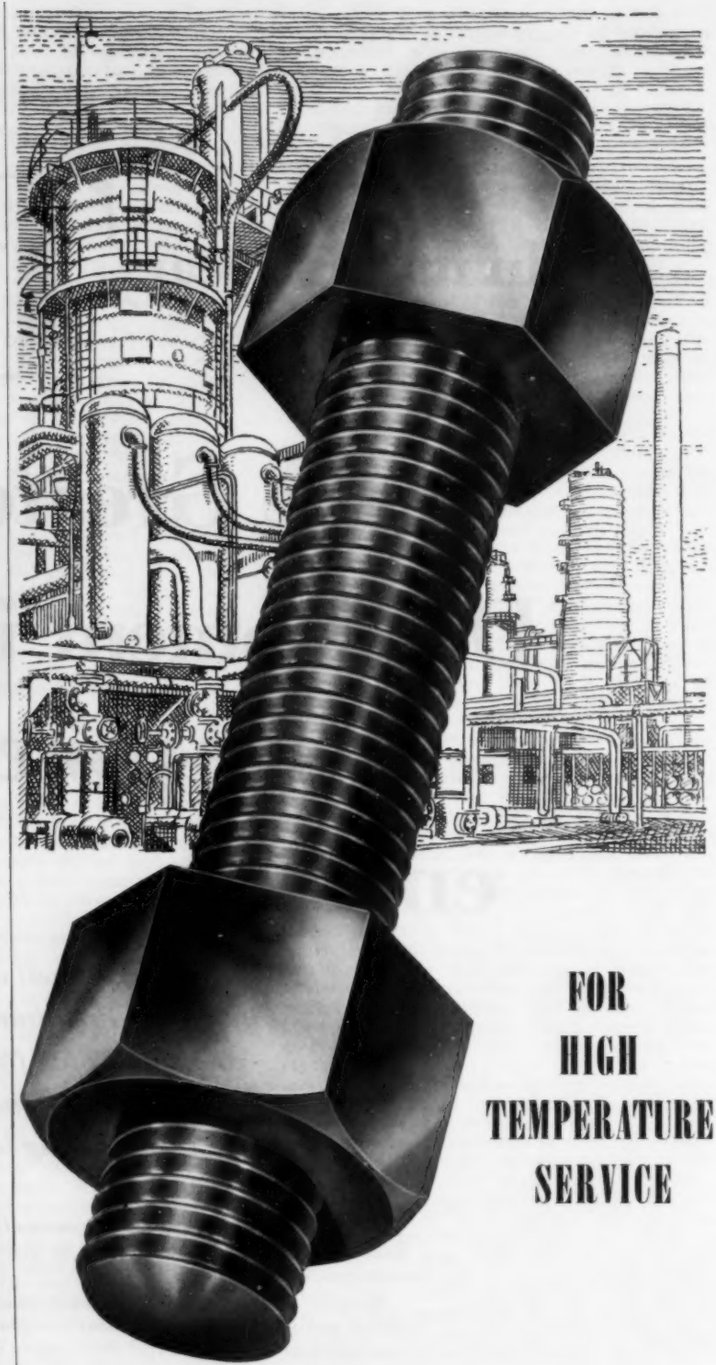

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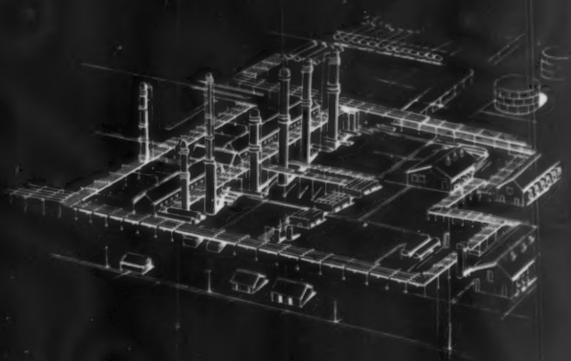

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New Martin-Decker Pressure Transformer

The Martin-Decker Corp. has perfected the E-80 Sensater, a diaphragm-type pressure transformer that works without friction and has no piston-rod to create problems of wear or corrosion. The diaphragm moves with its backing plate so that the area pushing against the hydraulic fluid remains constant, transmitting direct, no-lag signals to the weight indicator gauge.

IHC Catalog

The complete line of International Industrial Power products, 73 in all, is described in a new 48-page catalog just published by the International Harvester Export Co. Crawler and rubber-tired tractors and associated equipment as well as the line of power units is described.

The catalog, E-73-D, may be obtained from International Industrial Power distributors or by writing to Merchandising Services, International Harvester Export Co., 180 North Michigan Ave., Chicago I, Ill., U.S.A.

J. G. Pew

John G. Pew

John G. Pew, 83, a director of Sun Oil Co. and former president of Sun Shipbuilding & Dry Dock Co., died July 1 at his home in Rose Valley, Pa. He was president of Sun Ship from 1919 until he retired in 1950.

During World War II Mr. Pew directed the expansion of the Chester shipyard from eight building ways to 28 ways, together with new buildings and ships. As a result of this expansion, more than 50 percent of the tankers built in the United States during World War II were constructed at the Sun Ship yards. He also introduced at Sun Ship facilities for the manufacturing of refinery equipment.

Mr. Pew was also an acknowledged expert in the natural gas industry. He entered the gas field in 1886 at the age of 16 as a gas fitter's helper and had been president of the Peoples Natural Gas Co., Pittsburgh, Pa. and president of the Hope Natural Gas Co. of West Virginia before joining Sun Oil Co.

Sun Ship was only three years old and had launched only 10 vessels before Mr. Pew took the helm. He held the organization together during lean new ship construction periods by producing equipment for the oil industry and assorted needs of other industry. Under his leadership many marine contributions were made, such as pioneering the first all-welded ocean-going vessels and prefabrication of larger ship assemblies. Sun's T-2 tanker design was standardized by government contracts as the work horse for overseas gas and oil transportation in World War II. It was during this production that Sun's employment hit a peak of 35,600 employees, with one of the four yard units completely staffed by negro production workers. In all, 511 hulls were launched under Mr. Pew's management.

Nomads' Fathers and Sons

Fathers and sons were featured at the regular June meeting of the Los Angeles Chapter of Nomads. Three of the Nomads have sons who are also members of the chapter. These are: Web Wilson, father, and Bill Wilson, son, both of Web Wilson Oil Tools; C. E. Van Loozen, father, and Ed Van Loozen, son, the former with Ideco and the latter with Vansco; Hans Ross, father, and Ken Ross, son, both with Baash-Ross Oil Tool Co.

New regular members inducted at the meeting were Art Marshall of H. C. Smith Oil Tool Co. and Lee Nave of Axelson Manufacturing Co., the latter having been a member since last January, but out of the country until recently.

Bob Craig of National Supply Co. gave a talk and showed colored slides of his recent six-month trip through Europe, North Africa and the Middle East area. Red Connor of Transworld Management Corp. also spoke on the Middle East situation.

Guests at the June meeting of the Los Angeles Chapter of Nomads (above) are, from left to right (standing): Lucien Gambu of Pemex from Mexico; Epi Zubieta of National Supply from Mexico; Lyne Moore of Q.P.C. from Qatar; (seated) Bob Ballard of Mene Grande Oil Co. from Venezuela; T. P. Whittaker of National Supply from Colombia; and R. W. Grebe of Baker Oil Tools from Venezuela.

Appointed Otis Project Engineer

John V. Fredd has been appointed project engineer of Otis Engineering Corp., manufacturing affiliate of Otis Pressure Control, Inc., Dallas, Texas. He was formerly Otis' senior design engineer. Since 1947, Mr. Fredd has designed and contributed to the design of various types of Otis bottom-hole chokes, regulators, tubing and surface safety valves, cross-over equipment, and tubing and casing calipers now in universal use throughout the industry. He is now directing work on Otis permanent completion equipment, pipe line calipers, various two-zone completion tools, and sub-surface production equipment for flowing and pumping wells.

J. V. Fredd

Davison Chemical Appointment

William E. McGuirk, Jr., has been appointed executive vice president of Davison Chemical Co., division of W. R. Grace & Co. Mr. McGuirk became vice president of W. R. Grace & Co. in January 1954, a post he held until his new appointment at Davison was made effective.

IDECO Catalog

A new 64-page catalog, CC-54, published by IDECO, Dallas, Texas, describes the company's complete line of oilfield drilling, workover and servicing equipment. In addition to the Full View and Kwik-Lift masts, two new portable guy-less masts are shown: the Full-Lever-Lift and the Kwik-Lever-Lift.

New Shell Motor Oil

A new multi-grade motor oil has been developed by Shell Oil Co. which maintains less change in viscosity over the entire range of engine temperatures, and reduces the formation of engine combustion chamber deposits that cause knock.

E. L. DeGolyer

DeGolyer Elected to Dresser Industries Board

E. L. DeGolyer, petroleum geologist and oil executive, has been elected a director of Dresser Industries, Inc., Dallas, Texas. Mr. DeGolyer is a senior member of the consulting firm of DeGolyer & MacNaughton, Dallas, Texas. He is a director of the First National Bank of Dallas, the Louisiana Land and Exploration Co., Republic Natural Gas Co., Texas Eastern Transmission Corp., Southern Pacific Co., Great Plains Development Co., and is chairman of the *Saturday Review of Literature*.

The oil-finding career of Mr. DeGolyer began after a period of service with the United States Geological Survey, when he became a geologist for the Mexican Eagle Oil Co. He was one of the founders of Amerada Petroleum Corp., of which he was, at one time, president and chairman. He was also assistant deputy petroleum administrator for war, 1941-43; head of War Missions to Mexico, 1942; and to the Middle East, 1943-44.

Book Review

Wachs-Enzyclopedia (Encyclopedia of Waxes), Vol. I, by L. Ivanovsky; published by Verlag f. Chem.-Industrie, H. Ziolkowsky; Augsburg, Germany; 232 pages, 6½ x 5 inches.

This small book is a closely-written survey of all commercial waxes—vegetable, animal and mineral—their classification, physical and chemical properties, technology and uses direct or in mixtures, with special attention to retention theory, all well arranged for ready reference.

He fits the pipes that cross a country...

The minute oil gets above ground — it starts to go places. From the field to the refinery. From the refinery to the distribution center. From the distribution center to the consumer. *Wherever* oil goes, pipes usually play an important part. Big pipes... little pipes... short lines... cross country lines. That's where the pipefitter comes in — he's got to tend them. His skill is needed to keep oil moving, so that oil can keep America moving.

The Texas Company

TEXACO

Albanian Operations

Albania has two small refineries currently in operation, with a combined charging capacity of 30,000 tons per annum. Their products are delivered largely to Soviet navy units stationed at Albania's two naval bases. Some 50,000 metric tons of production are imported, mostly from Rumania.

Crude production in 1953 totaled 268,000 metric tons, a considerable reduction from the 1952 record of 314,000 metric tons.

The Alsov-Petrol trust is trying to make up for this decrease by exploration. Thus far, it is apparently without much result in the southern area, since the entire 1953 production came from the Devoli field. There the Cerrick refinery is to be completed in late 1955, with a planned charging capacity per annum of 150,000 tons.

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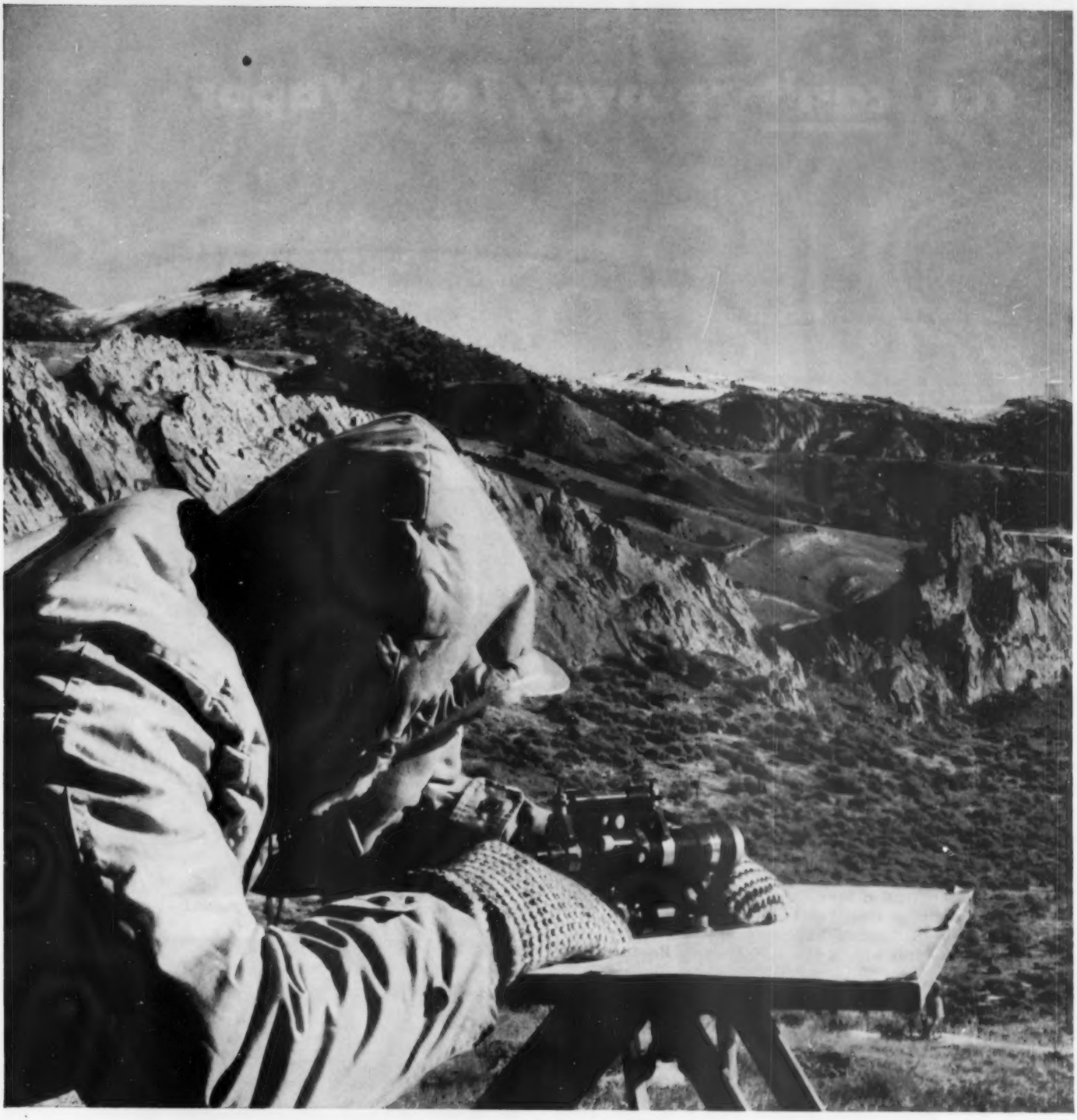

"To the free man, all things are possible. Opportunity is the wand which can change the useless into the useful, waste into raw materials of great value, exhaustible resources into inexhaustible resources. It is the key that unlocks the greatest energy source of all—the infinite power of the human individual."

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Floating directly on the surface, the entire bottom of a Horton Floating Roof is normally in contact with the liquid in the tank. There is no air-vapor mixture above the liquid to be vented and lost. Fire hazard and corrosion are also reduced as a result of the elimination of the air space.

Horton Floating Roofs are built in three types, Double-Deck, Pontoon and Pan. Let us help you select the roof most suitable for your operation. Write our nearest office for further information or quotations. There is no obligation.

Looking into a 90-ft. diam. tank with Horton Double-Deck Floating Roof.

The rule shows the snug fit of the Horton seal closing the space between the tank's shell and deck of the Horton Floating roof.

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Westinghouse Controls Stand Guard

for the Mene Grande "Navy"

Maintenance men ride to work in power launches at Mene Grande's 500-well underwater oil field on Lake Maracaibo in Venezuela. At many of the wells their job is a lot easier because Westinghouse automatic controls stand guard 24 hours a day over continuously operating pumping motors.

This weatherproof oil well pumping control for single-speed, squirrel-cage motors has proved its dependability in operations where it is impractical to post a man at each well. Providing across-the-line motor starting with complete overload and low-voltage protection, this Westinghouse control does more than merely trip off when trouble develops. If a temporary overload occurs, the control keeps the motor operating. If the overload persists, however, the control shuts down the motor before the danger point is reached. Control cabinet is suitable for surface or pole-mounting.

An optional feature of the control which pays big dividends in multi-well operations such as the Mene Grande field is the Westinghouse AM Relay Timer. This prevents system overloads after power failure by automatically restarting motors in staggered sequence.

We'd like to tell you more about this automatic pumping motor control as well as other Westinghouse equipment for oil field electrification. Write for your free copy of our new booklet B-4039.

YOU CAN BE **SURE** ...IF IT'S

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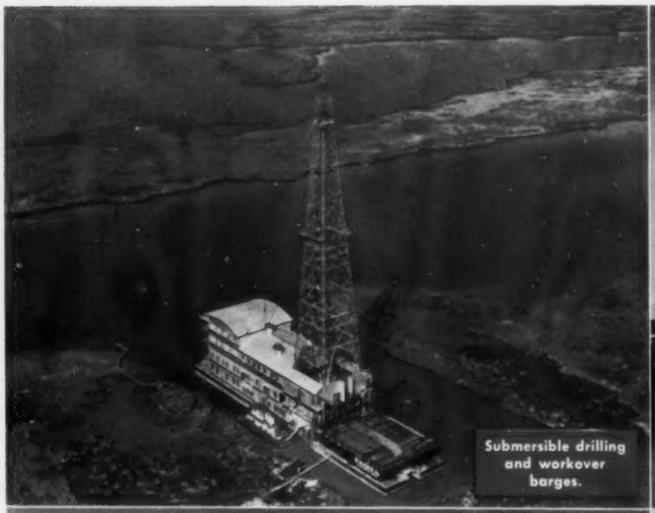
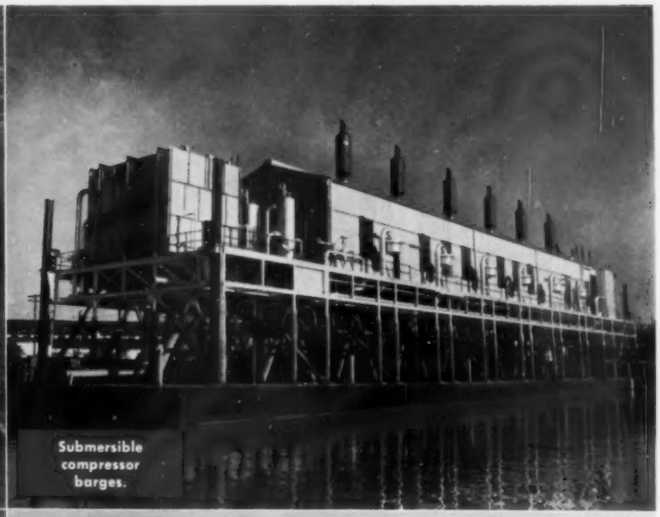
WESTINGHOUSE ELECTRIC INTERNATIONAL COMPANY

40 Wall Street, New York 5, U. S. A.



Submersible drilling and workover barges.



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